Medicine for Nurses

AND OTHER PUBLIC HEALTH WORKERS

By

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PREFACE TO SECOND EDITION

The request of the publishers for a revision of this text-book for nurses has given the author the opportunity of bringing the material of the book up to date; of adding matters that were apparently overlooked in the previous edition; and of increasing the material along other lines. It is hoped that this will make the book much more useful—both for the classes of the nurses as well as for individual reading.

Additional experience has confirmed the view of the author that public-health nurses should receive more information and training than they get in their undergraduate days in a hospital. In all probability the greatest need is the difference in the viewpoint—that is, the public-health nurse to be efficient must get the viewpoint of the community, or the public-health viewpoint. In other words, she must think more of preventing disease than she does of curing the individual patients. The cleavage between the two viewpoints has become particularly apparent in the medical profession where preventive medicine is now emerging as not merely a side issue, but probably an associate of equal importance with curative medicine. In other words, it is true that the individual patient must be relieved of his suffering and the disease wiped out as soon as possible, but it is also true that we must protect others from taking the disease, and all learn to look after sanitation in general.

The author would thank the publishers for their excellent care of his manuscript and preparation of the book, and Mr. J. W. Becker, the secretary of the Missouri State Tuberculosis Association, for his suggestions as to

the chapter on tuberculosis, Dr. J. W. McKee for looking over the chapter on commoner eye lesions, Mrs. Rosa M. Hibbard for reading critically the statistics on the prevalence of disease, Dr. David S. Dann of the General Hospital for the loan of *x*-ray films, and last, but not least, his associates, Miss Gladys Lisherness and Mrs. C. Cherry, for their help in preparation of the material.

G. H. HOXIE.

KANSAS CITY, MO.,
January, 1928.

PREFACE

THE changes in the nursing profession during the last five years make advisable a complete rewriting of many of the text-books used in the training-schools. Of these changes I need to mention only two. The first is the crystallization of the courses of study through the efforts of the National League of Nursing Education; and the second is the increased employment of nurses in public health work.

It is to meet the demands made by these changes that I have recast my "Manual of Medicine for Nurses" to make it fit in with the recommendations contained in the two published reports of the committees on the education of nurses. Thus, the communicable diseases are grouped by themselves and the constitutional and organic diseases arranged in such a way that the courses may be given without jumping from one chapter to another or from one part of the book to another.

Then, too, the growing realization that perhaps the broadest field for the professional nurse lies in her acting as a school nurse or as a county nurse or in similar public health work where she has to be the counsellor and advisor on health matters for her clientele, has made it necessary that even undergraduate nurses be given instruction based on the standpoint of preventive medicine. In other words, while our books have hitherto addressed the nurse chiefly in her capacity as the physician's helper in care of individual diseases, this text seeks to inform the student nurse of the origin of the diseases and the means of preventing them.

The material has been, of course, collected from various sources, so that no claim is made for originality. The material has been put in as succinct a form as possible and it is hoped that clarity has not thereby been lost.

My thanks are due to my co-workers, especially to Dr. Watson Campbell for photographs of patients, to Gladys M. Lisherness, A. B., for drawings and statistical studies, and to Miss Helen D. McClure for her painstaking work in preparing the text.

G. H. HOXIE.

KANSAS CITY, MO.

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MEDICINE FOR NURSES

AND OTHER PUBLIC HEALTH WORKERS

PART I

THE COMMUNICABLE DISEASES

COMMUNICABLE DISEASES AND PREVENTIVE MEDICINE

COMMUNICABLE diseases are caused by living agents which develop and live and in most cases propagate inside the body. They cause death or endanger the life of the patient through their presence, in that they may use up the vital energy of the body for their own development; or they may directly inhibit or paralyze the higher nerve centers by their toxins. Their portal of entry is usually the respiratory tract—that is, the mucous membranes of the nose, the throat and tonsils, larynx, the trachea, the lungs. But the entry may be through the digestive tract, as in the case of typhoid fever, with the food. And, third, it may be through abrasions of the skin, as in the case of erysipelas.

For the most part, communicable diseases are preventable diseases. And the efforts of the public health workers are directed toward eliminating these diseases. One may say that the standards of civilization can be determined by the presence or absence of epidemics due to such preventable diseases. As Christian civilization advances these diseases should gradually disappear.

The last generation has witnessed great conquests in the field of communicable diseases. Thus, as Dodson points out:

"To one who is familiar with the stupendous progress in our knowledge of disease in the last sixty years dating from the epoch-making discoveries of Pasteur, a progress which exceeds that of all the previous centuries, little argument is needed to make it clear that the practical benefits of this advance lie almost wholly in the field of preventive medicine.

"More than twelve years have been added to the average human life. The diseases of infancy and early childhood have been conquered to such a degree that in every well-conducted city the deaths in this early period of life are less than half what they were twenty or twenty-five years ago in proportion to the population."

"Yellow fever, one of the most dreaded and fatal scourges of mankind, has been all but abolished from the civilized world even in its endemic focus in Equador. Typhus, or ship fever, the dreaded tabardillo of the tropics, has been robbed of its terrors and made entirely controllable by the discovery of its mode of transmission through the louse. During the World War, after thousands had succumbed to this disease in the Balkans, and in Russia, the epidemic was promptly and completely arrested by the delousing of soldiers and civilians by relatively simple means. Typhoid fever, the paratyphoids, and the dysenteries, up to twenty years ago the most prevalent and fatal of army diseases, have been conquered through our knowledge of the modes of transmission, by the provision of pure water and food, by the detection and segregation of typhoid carriers, and by inoculation against these diseases. Malaria also, by reason of the discovery of its mode of transmission through the Anopheles mosquito, has been brought under control. And vast areas of the most fertile and productive portion of the earth, hitherto all but uninhabitable for the Caucasian race, may now be occupied and cultivated by men of any race. Cholera, once a frequent visitor to our own nation, as well as to others, sweeping in vast pandemics from its endemic focus in

India, has not visited the United States for a generation; and with a constant watchfulness may be prevented from ever again becoming a scourge. The plague likewise has been all but exterminated, and may be completely abolished from the civilized world by the diligent application of our present knowledge."

And we may now add diphtheria to the list of fast disappearing diseases. Scarlet fever is next on the list.

The accomplishment of these results has come about through the application of hygiene to community life as well as to the individual. In fact, it is due to the realization of the solidarity of society that community hygiene has been made possible. For we now know that a city cannot have communicable diseases in its slums and be healthy and prosper in its exclusive residential districts. The workers and unfortunates cannot be neglected without danger to the employers, the capitalists, and the leisured classes.

We may utilize, therefore, the two following definitions of hygiene at the beginning of our discussion:

Personal hygiene is that body of knowledge and practice by which each individual protects himself from disease which might come to him by invasion from without, or by disturbance of normal physiologic practices within his own body.

Modern community hygiene has been defined by Winslow as the science and art of preventing disease, prolonging life, and promoting physical health and efficiency through the organized community efforts for the sanitation of environment, the control of community infections, the education of individuals in principles of personal hygiene, the organization of medical and nursing service for the early diagnosis and preventive treatment of disease, and the development of social machinery which will insure to every individual in the community a standard of living adequate for the maintenance of health.

CHAPTER I

THE TRANSMISSION OF COMMUNICABLE DISEASES

Transmission of Disease.—The following table, modified from Hill, will give such an excellent starting-point for our discussion that it has been reproduced here:

Typhoid fever (and other intestinal infections) are carried chiefly by	water; food; flies; milk; contact.
Tuberculosis (human) is carried chiefly by	flies; milk; contact.
Diphtheria, scarlet fever, measles, German measles, mumps, whooping-cough, smallpox, chickenpox are carried chiefly by	milk; contact.
Syphilis, gonorrhea, trachoma, pneumonia, cerebrospinal meningitis, leprosy are carried chiefly by	contact.

Contact.—Under "contact" we understand not only the ordinary meetings and intercourse of people, but more particularly the result of the so-called droplet infection. That is, the spray carried out with the breath in expulsive efforts, such as coughing, sneezing, loud talking and laughing, contains myriads of organisms of the types that happen to be lying in the nose, mouth, and throat at the time. These may be carried to a distance of 5 or 6 feet. The bacteria contained in these droplets are, therefore, easily breathed in by persons within that range, and thus become infective to those individuals.

Under *contact*, also, we include manual infection; that is, the hands become fouled by touching soiled clothing and articles of food, utensils, furniture, etc., and the virus is thus conveyed to the mouth and swallowed.

It will be noted that a great majority of the communicable diseases are spread by contact, whether they are spread otherwise or not. From the public health standpoint, therefore, contact is of the utmost importance. And, therefore, the quarantining of patients, the isolation and segregation of patients, is essential if we are to prevent the spread of infectious disease.

It is on account of the droplet infection that surgeons and nurses wear gauze masks over their mouths when working with open wounds in order that they may not drive the bacteria contained in their mouths into the open surfaces. Similarly in the presence of the pest (or plague), and similarly extremely infectious diseases, it is wise for the workers to wear masks over the entire face in order that they may not breath in the organisms which are being excreted by the patient. But it should be remembered that such gauze masks become easily contaminated, and should be sterilized and cleansed after each contact.

Milk.—The problem of the control of a public milk supply is a threefold problem.

The inability of the average American community to secure for itself a high-grade milk at a reasonable price is due, in my opinion, to the fact that most sanitarians and public health officials have directed their attention to only one of the problems and have neglected entirely the other two.

Public health officials in charge of milk control should bear in mind three things:

First. That the stimulation of milk drinking and the increase of its use in cooking is an important measure for the improvement of personal hygiene. Increased milk drinking for everybody, men as well as women and children, especially if it cuts down the use of such stimulants as coffee and tea, means increased efficiency and well being. Increased use of milk in cooking means better meals at a lower cost. But people will not drink and use milk enthusiastically and in large amounts simply as a duty, or

because their family doctor tells them to. They will drink milk if, and only if, it is palatable and delicious to the taste. Fresh, clean milk tastes good. Stale, dirty milk does not.

Only those health officials, therefore, who recognize that health promotion is one of their chief duties will see the necessity of promoting and stimulating the production of appetizing milk in adequate quantity and at a reasonable price.

This can be done only by educating dairymen to produce such milk. In other words, an official milk inspection department must be first of all an educational department.

Second. That milk to be safest and best for infant feeding must be as fresh and free from bacteria as possible. The measure of cleanliness for milk for infant feeding is a bacterial count of 10,000, or less per cubic centimeter.

The difficulty has been that most communities have ignored these facts and have remembered only the third—that milk may very easily become the vehicle for the spread of such communicable diseases as tuberculosis, typhoid fever, scarlet fever, diphtheria, and septic sore throat.

Such communities have believed that their one duty was to pasteurize all their milk supply to prevent epidemics. The result has been a comparatively safe milk from this one standpoint, but entirely inadequate in the light of the other two requirements; for dirty, stale, unpalatable milk is not made appetizing by pasteurization, nor yet suitable for infant feeding.

In order to fulfil all three requirements milk should come from healthy cows; should be so handled as to take up neither odors nor dust nor dirt on its journey from the cow to the closed final container, since such contamination destroys its naturally delicious taste and appetizing flavor; should be quickly cooled and kept cool so as to prevent the development of large numbers of bacteria, which would render it unsuitable for young children; and should

reach the consumer in as fresh a state as possible. Unless production and handling can be so controlled, and contamination so prevented as to keep the bacterial count down at the time of delivery below 50,000, the milk should be pasteurized.

Pasteurization should, however, be considered an added precaution to prevent the possible spread of communicable disease, not as a substitute for cleanliness and decency in handling. It is too often used simply to prolong the life of dirty milk which, because of its high bacterial content due to dirty handling and lack of cooling, would sour too quickly to be salable.

For safety's sake if milk is to be sold raw, and for the sake of flavor and palatableness, if it is to be sold either raw or pasteurized, all requirements for milk production and handling should be based on the following general rule, remembering that milk picks up bacteria from the air to which it is exposed, the strainer cloth it passes through, and the utensils it touches:

Milk should travel from the inside of the healthy cow to the inside of the closed final container in the shortest possible time, over the shortest possible route, touching on the way as little air and as few utensils as possible. The air should be as pure and free from dust and odors as possible, and the utensils should be as nearly sterile as it is possible to make them.

Furthermore, if the milk is to be pasteurized it should be pasteurized under such rigid official inspection and supervision as to insure its being efficiently pasteurized and not simply incubated, and the pasteurization should not interrupt delivery to the consumer more than is absolutely necessary. A test of the efficiency of the pasteurization is the reduction of 90 to 98 per cent. of the bacterial content of the milk. If this general principle is kept in mind, the necessity for the following rules governing methods is quickly seen:

1. Cows should be healthy and free from tuberculosis,

as indicated by tuberculin tests made annually; or, if the milk is to be sold raw, semi-annually.

2. The bodies of the cows should be free from visible dirt at milking time. The hair about the udders should be kept clipped and the udders washed before each milking.

3. Contented cows. Milk-cows are not to be exposed to undue weather conditions, and are not to be subjected to abuse of any kind.

4. An abundant pure water supply is necessary.

5. When the climate necessitates keeping the cows much of the time indoors, the stable should have 500 cubic feet of air per cow, and three to four square feet of window space.

The walls and ceilings should be tight (so as to keep the air dust-free at milking time), kept free from cobwebs, and if not painted should be whitewashed twice a year. The floor must be tight, and at milking time, clean. If the floor is not washable, it should be limed daily, preferably after each milking.

6. While in the barn milk should not be poured from one receptacle to another, but should be carried at once to the milk-house, strained (if milking has been carefully done, one straining through sterile gauze or sterile canton flannel should be sufficient), immediately cooled to 50° F. or below, and if it is to be sold raw, placed at once in the bottles or other closed final container. Milk-rooms should be free from odors, flies, and dust. The milk-house should be used for no other purpose than handling milk.

7. Covered milking-pails should be used.

8. The milker should wear clean outer garments, and wash his hands thoroughly with a hypochlorite disinfectant before and several times during milking. All workers in pasteurizing plants and in dairies which sell raw milk, who come in contact with the milk, should undergo a monthly examination by a physician, and should be taught the necessity of reporting promptly to the health department any illness on the part of themselves or members of their families.

9. All utensils, pails, cans, strainer-cloths, bottling machine, etc., which come in contact with the milk must be sterilized and kept from recontamination until used.

Especially is this true of bottles which, because they pass through many homes, may prove collectors of germs to be distributed to all the customers on the dairyman's route. Should the germs be those of a communicable disease an epidemic may result. They should be washed clean and sterilized with boiling water, or steam at a temperature of 212° F., or held in a steam cabinet for twenty minutes at a temperature of 210° F., or for thirty minutes at a temperature of 200° F.

10. Milk should be kept cool—under 50° F. until delivered to the consumer.

11. Milk should not be permitted to freeze. Frozen milk should never be fed to children.

Care of Milk in the Home.—The intelligent housewife judges and chooses her milk less on the cream line than on the cleanliness with which it was produced.

Delivery should be at an hour when the milk can be received and put into a proper place for storage—a place that will keep the temperature always under 50° F., and that will, in winter, prevent freezing. Milk delivered during a hot night, and allowed to stand on the doorstep several hours until the family arises, may become quite unfit for infant feeding.

The milk-bottle should be placed under the cold-water faucet and washed off before it is placed in the refrigerator, and before the cap is removed.

Always keep milk covered. After the removal of the bottle-cap, a clean inverted tumbler makes the best bottle cover.

If the milk is for infant feeding, pour out from the bottle only the amount to be used. Never pour unused milk back into the bottle.

Bacteria in milk at ordinary room temperature may double in number every fifteen or twenty minutes. Milk

should, therefore, not be heated for feeding until feeding time.

Milk bottles should be returned to the dairyman clean.

Water.—The sanitation of the water-supply demands the same sort of control as does the milk. The water must be from a clean source, must be distributed in a clean manner, and must not be contaminated at the point of use. At the present time the greatest difficulty is to secure a pure water-supply. Therefore, for cities it has been found necessary that the water should be filtered and thus purified before being turned into the mains for drinking purposes.

Fig. 1.—Tsetse fly.

Public health nurses will have great trouble in trying to convince people that the water of springs, bubbling out of the ground, is impure or unhealthful. Yet, this is the source of most of the contamination of water in the country and in the smaller cities.

In order to teach people the meaning of the above paragraph one must show them the difference between surface water, or ground water and water that comes up from the depths. That is, ground water or surface water is water collected from the rains and surface washings. This has filtered down into the sources of the spring or the well, and carried with it the contamination from manure piles, from privy vaults, etc.

As a general policy, therefore, it is well to test the sources of drinking-water carefully and at frequent intervals. The location of wells should be more carefully scrutinized.

Nurses and public health workers should note whether the gardens attached to the homes which they visit are being fertilized with "night soil" (that is, human excreta). Where this is done, as in China and in Switzerland, it is impossible, of course, to eat the vegetables from those gardens raw.

Food-stuffs.—Under "food-stuffs" the important point is that they should not be spoiled or rotten to begin with, and then should not be contaminated by flies, and dirt, and dusty air while they are being distributed or offered for sale. People have, as a rule, been quick to detect and reject spoiled foods, but, for the most part, the greatest difficulty has been to prevent the contamination of food during its preparation and distribution.

In the cities great attention is now being paid to vegetables exposed for sale in particular as to whether they are kept covered or under glass, in order that there may be no deposit on them of dust and dirt from the streets, and that flies may not reach them.

Then again, in most of our cities there are ordinances that food-handlers shall be examined quarterly to prevent their having such communicable disease as syphilis, tuberculosis, etc. This ordinance is difficult to enforce, but is of considerable importance. Its enforcement would be a step in the campaign for the segregation of the tuberculous and syphilitic.

Flies.—Under "flies" we would include also the various insects of which flies are the chief exponents. In order to combat such transmission adequately we must know the life history of the various insects, and for the convenience of the reader we are going to summarize some of these life histories. For the history of military compaigns and the history of sanitation in cities both show that

through the elimination of these insects the greatest advances have been made toward prolonging the lives of our people and in preserving their health.

Mosquitoes.—The important thing to know about mosquitoes is their breeding habits and how one can exterminate them. The Anopheles mosquito, which transmits the malaria, is one that grows or breeds in the stagnant and slow-running waters of the warmer countries. The Stegomyia fasciata, which transmits yellow fever, however, breeds around the house in cans, buckets, and barrels containing stagnant water. In either case, to destroy the larvæ in these breeding places it is necessary to cover the water with a film of oil. Still better is it, of course, to clean out such breeding places and prevent the formation of new ones.

Fig. 2.—Eggs of the malaria mosquito.

Malarial Mosquito.—The Anopheles is the only mosquito that carries malaria. Of this genus, sixteen varieties are positively known to transmit the disease. The most important of these are: Anopheles maculipennis, Anopheles crucians, and Anopheles punctipennis. To understand how to prevent malaria it is necessary to be able to differentiate the Anopheles mosquito from other varieties. Charles E. Craig, of the United States Army, suggests the following points in the differentiation of the Anopheles. These will serve for all practical purposes:

"1. *The Ova.*—The ova of the *Anophelinæ* are never found in masses, but laid singly upon the surface of the water, the ends often being connected, thus forming geometric patterns. They are further distinguished by the possession of lateral 'floats,' which never appear on the ova of other mosquitoes.

"2. *The Larvæ.*—The larvæ of the *Anophelinæ* are easily distinguished from those of other mosquitoes by the absence of the long respiratory tube or siphon. Because of this the Anopheline larva is compelled to lie parallel with the surface of the water, while other mosquito larvæ hang head downward at an acute angle with the surface of the water. In addition, the small, narrow head of the Anopheline larva distinguishes it from other mosquito larvæ.

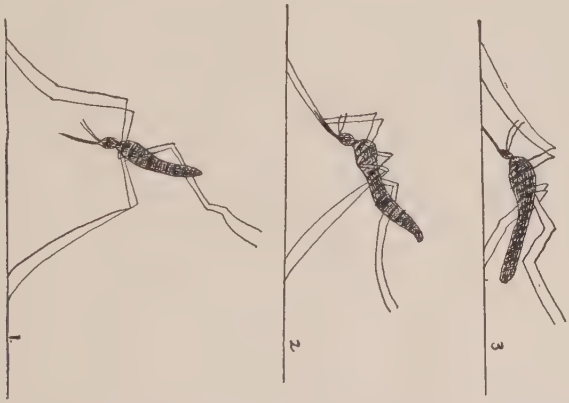

Fig. 3.—1, 2, Position of the malaria mosquito when resting on the wall. 3, Position of ordinary mosquito when resting on the wall.

"3. *The Imago or Adult.*—The following points distinguish the adult Anopheline from other adult mosquitoes:

"(*a*) *The Relative Length of the Palpi and the Proboscis.*—In the *Anophelinæ* the palpi of the female are as long as the proboscis, while in other mosquitoes the palpi are shorter than the proboscis. The males are distinguished from the females by plumose palpi. By attention to this simple detail any mosquito may at once be placed so far as its relation to the *Anophelinæ* is concerned.

"(*b*) *The Angle of the Proboscis with the Body.*—The

proboscis in the Anopheline never forms an angle with the rest of the body, but continues in a direct line with it, as already stated.

"(*c*) *The Resting Position.*—When resting upon a surface most of the *Anophelinæ* form a distinct angle with the surface, while other mosquitoes appear humpbacked, owing to the fact that the abdomen is nearer the surface than the thorax.

"(*d*) *The Spotted Wings.*—Most of the *Anophelinæ* have spotted wings, and while some other mosquitoes also present spots upon these structures, it is a good practical rule to regard with suspicion any mosquito having spotted wings, as the chances are altogether in favor of its being an Anopheline."

The Anopheles will breed in almost any kind of water, but they prefer clear, more or less pure water. The stream may be large or small; any collection of water is suitable for their propagation, such as that in wells, cisterns, ponds, gutters, broken bottles, cow tracks, open ditches, or even sewers. Furthermore, this variety of mosquito prefers shady spots with much vegetation, avoiding the direct rays of the sun.

As regards feeding, Anopheles are blood-sucking insects. The blood of man is not the only blood they like, but it is known that they also like the blood of horses, cattle, birds, and the like. The skin of the human being is much softer than that of most other animals. This is, perhaps, the reason why the mosquito seems to prefer to suck the blood of human beings. It is an accepted fact that they prefer large animals to small ones. There are many things which affect the feeding of this variety of mosquito, such as conditions of the weather, temperature, or the time of day. The Anopheles rarely bite while it is raining, but immediately after the rain they seem to bite more vigorously. They have not been observed to bite in cold weather, and evidently high temperature stimulates their appetite. Their mealtime is in the twilight, although,

during real warm weather, they may bite at night or in the heavy shade during the day. After finishing their meal they try to escape from the house and seek shelter nearby in the grass or in the foliage of the trees. Those unable to escape from the house can be found during the day in dark corners and under furniture. (University of Missouri Bulletin, vol. 16, No. 28, Series 10, p. 6.)

The *Stegomyia fasciata* (or Aëdes ægypti), the yellow fever mosquito, is a house-dwelling and a house-breeding insect. It flies by day and is found in the living rooms as

Fig. 4.—Yellow fever mosquito.

well as bedrooms of unscreened houses, particularly between 9 or 10 and 4 or 5 o'clock. It breeds in gutters, old cans—even in water pitchers. Particular attention should therefore be paid to the smallest as well as the largest collections or reservoirs of standing water within and about habitations. The most conspicuous markings of the Stegomyia fasciata are the broad semilunar silvery stripes which are seen on the lateral surface of the thorax, and the white stripes at the bases of the tarsal joints. These may be readily distinguished with the naked eye.

The bands on the hind legs are especially well marked, and occasionally the entire fifth hind tarsal joint seems to be of a pure silvery white. The four stripes of silvery scales on the posterior surface of the thorax serve to distinguish this species from all other mosquitoes except Stegomyia signifer, in which, however, the curved thoracic band is very narrow and of a somewhat different shape. Examined with a hand lens, the four stripes are seen to consist of two lateral silver lines—the continuation of the semilunar broad stripe, and two fine white lines which are situated between these and which require that the lens be held in the proper light in order that these delicate threads may be distinctly seen. The lateral surface of

Fig. 5.—Eggs of the yellow fever mosquito.

the thorax is also marked by several silvery dots, and the abdomen by the thin white stripes. This description applies to both sexes. In the female the palpi are short, as in the genus Culex. The proboscis is of a dark, blackish-brown color and is marked with a whitish band near the middle. In the male one of the front tarsal claws bears a tooth on the under side, while the other claw is destitute of such marking. In the female both front tarsal claws bear a distinct tooth near the base of the under side of each.

The insect lays her eggs during the night and, unlike the Culex, which deposits her eggs in boat-like masses, the Stegomyia extrudes her eggs on the surface of the water in pairs, in groups of three or four, or singly—in this

respect resembling Anopheles. Exceptionally the eggs are deposited in a rather close-lying mass. The whole batch is laid in one night or extending over two or three nights. The number of eggs deposited varies from about twenty to seventy-five, rarely a larger number. At the same time that the female deposits her eggs, she frequently but not always discharges a fluid which forms a very thin film over the surface of the water which possibly assists in floating the eggs. The latter are of a jet black color, and to the naked eye cylindric in shape, one end of the egg being rounded and blunt, while the other is slightly pointed—the whole resembling closely a short, fat cigar. They measure about 0.65 mm. in length by 0.17 mm. in width at the broadest point. Under a low-power lens the surface of the egg is seen to be marked by tolerably regular six-sided plates each of which is further marked by a little round elevation which gives to the surface of the egg a decidedly roughened appearance. Drying is but slightly injurious to these eggs. The impregnated female, having obtained a meal of blood, proceeds to deposit her eggs in captivity after an interval varying from two to thirty days. As a rule the eggs are laid within seven days. Sometimes a second or third meal of blood is taken before any eggs are laid. Eggs placed under favorable conditions of warmth begin to hatch, as a rule, on the third day, the period extending to about one week. The larval stage requires seven or eight days and the pupal stage about two days. The period for the generation may be stated, therefore, as follows: incubation period, three days; larval stage, seven days; pupal stage, two days; total, twelve days. As the eggs begin to hatch before the expiration of the third day, we generally obtain a few mosquitoes on the eleventh day.

Mosquitoes when deprived of water die within a few days. Even if allowed to fill themselves with blood immediately before the experiment is begun and then de-

prived of water, practically all are dead at the expiration of the fifth or the commencement of the sixth day.

House Fly.—The house fly, which is found in nearly all parts of the world, is a medium-sized fly with four black stripes on the back and a sharp elbow in one of the veins of the wings. The house fly cannot bite, its mouth parts being spread out at the tip for sucking up liquid substances.

The eggs are laid by preference upon horse manure. This substance seems to be its favorite larval food. It

Fig. 6.—Common house fly: It spreads disease by depositing the germs in its excreta. Other germs stick to its legs and are deposited on food material and elsewhere.

will breed also in human excrement, and because of this habit it is very dangerous to the health of human beings, carrying as it does the germs of intestinal diseases, such as typhoid fever and cholera, from the excreta to food supplies. It has also been found to breed freely in hog manure and to some extent in cow and chicken manure. Indeed, it will lay its eggs on a great variety of decaying vegetable and animal materials, but of the flies that infest dwelling houses, both in cities and on farms, the greater number come from horse manure.

It often happens, however, that this fly is very abundant in localities where little or no horse manure is found, and in such cases it breeds in other manure or in slops or fermenting vegetable material, such as spent hops, moist bran, ensilage, or rotting potatoes. Accumulations of organic material on the dumping grounds of towns and cities often produce flies in great numbers.

The number of eggs laid by an individual fly at one time undoubtedly is large, probably averaging about 120, and as a single female will lay at least two and possibly four such batches, the enormous numbers in which the insects occur are thus plainly accounted for, especially when the abundance and universal occurrence of appropriate larval food is considered. The eggs are deposited below the surface in the cracks and interstices of the manure, several females usually depositing in one spot, so that the eggs commonly are found in large clusters in selected places near the top of the pile, where a high degree of heat is maintained by the fermentation below. The eggs usually hatch in less than twenty-four hours. Under the most favorable conditions of temperature and moisture the egg state may last hardly more than eight hours. The maggots which issue from the eggs are very small and transparent. They grow rapidly, completing the growth of the larva stage in four or five days. The larva period may be prolonged greatly by low temperature or by dryness or scarcity of the larval food. As the larvæ attain full size they gradually assume a creamy white color. Just before pupation they become very restless and migrate from their feeding ground in search of a favorable place in which to pass the pupa stage. They will often congregate at the edges of manure piles near the ground or burrow into the soil beneath, or they may crawl considerable distances away from the pile to pupate in the ground or in loose material under the edges of stones, boards, etc.

The pupæ, or "sleepers," are more or less barrel shaped

and dark brown in color. In midsummer this stage lasts from three to ten days, four to five days being the usual duration. The pupa stage is easily affected by temperature changes and may be prolonged during hibernation for as long as four or five months. Numerous rearing experiments in various parts of the country have shown that the shortest time between the deposition of eggs and the emergence of the adult fly is eight days, and ten and twelve day records were very common.

The adult fly, upon emerging from the puparium, works its way upward through the soil or manure and upon reaching the air it crawls about while its wings expand and the body hardens and assumes its normal coloration. In a very few days the female is ready to deposit eggs. In recent experiments it was found that the time between the emergence of the adults and the first deposition of eggs is considerably shorter than previously was thought to be the case. Only three or four days are necessary in midsummer for the female to reach sexual maturity. As in the case of other periods of its life history, so the pre-oviposition period is prolonged considerably by the lower temperatures of spring and autumn. In midsummer, with a developmental period of from eight to ten days from egg to adult, and a pre-oviposition period of from three to four days, a new generation would be started every eleven to fourteen days.

Lice are degraded wingless insects and are divided into two groups according to their method of feeding. The Mallophaga include animal lice, like the bird lice, which feed on the hair and feathers of animals, but do not suck blood. As far as is known, these lice do not transmit disease. The Anoplura, or sucking lice, feed upon blood, and this is the group concerned in the transmission of disease. Lice do not travel much and stick fairly close to one host. Human lice belong to three species—*Pediculus capitis*, *Pediculus vestimenti* or *corporis*, and *Phthirius pubis*.

A newly hatched louse is about the size of a pinhead;

while a full-grown, well-fed louse is about $\frac{1}{6}$ inch in length. The louse has a smooth, hard, chitinous covering which is impenetrable to most chemicals. The body is divided into head, thorax, and abdomen. At the sides of the head are two antennæ, the mouth has a long sharp stylet or stabber, which is used for puncturing the skin. This stylet consists of three parts which are so formed as to make a hollow tube through which the blood flows. Attached to the thorax are six legs and at the end of each is a single large claw. The abdomen is divided into six or eight segments, the terminal one is indented in the female and rounded in the male. The abdomen in the female is broader than that of the male. Both sexes bite and convey disease.

The eggs are laid on fibers of clothing or on body hair. They prefer to lay eggs on rough material, such as felt, wool, and flannel. The eggs are ovoid, about $\frac{1}{26}$ inch long, with a long granulated end or operculum. They are firmly cemented to the hair. The freshly laid egg is almost transparent, but when the embryo develops, it assumes a yellowish color. The empty shell is hard and remains attached after the louse has emerged. The shell and the cement are resistant to chemicals and no solution will remove it without first destroying the hair or fiber to which it is attached. At the temperature which ordinarily exists between the skin and the clothing the eggs hatch in from seven to ten days. If kept in a cooler temperature the incubation period is lengthened. The first molt occurs after two days, the second two days later, and the third after three days. The complete cycle from egg to egg takes about sixteen days.

Phthirius pubis, or crab louse, looks different from the Pediculus and closely resembles a crab. It is about 1/16 inch long and is usually found in the pubic or perianal region, but may be found over the abdomen and chest, axillæ, and down over the thighs. Crab lice have been found in the eyebrows. The nit is laid close to the base

of the hair. Phthirius feeds almost continuously and hence dies soon after being removed. The female lays about twenty-five eggs in her lifetime. The eggs hatch in about seven days. Development occurs in the same length of time as in the case of the Pediculus. Lice convey typhus fever and trench fever.

Scabies.—Sarcoptes scabiei (Acarus scabiei). The female is the active agent, the male usually absent. The habitat is a burrow in the epidermis often of the axilla or lower portion of the abdomen, and yet more commonly the finger webs and the lateral exposed surface of the digits. Characteristic scratch-marks of erosion direct attention to the burrows which appear as short dark lines leading to a shining spot. The female louse, which may be seen with the naked eye, may be removed by passing a needle along the black line of egg deposit to the spot which indicates her presence.

Fleas.—The Egg.—The eggs are ovoid in shape and white or creamy in color, some strongly reminding one of miniature china eggs. Although rather small, they are readily seen with the naked eye, especially if placed on a dark piece of cloth or paper. They are formed after the female has been feeding on a host for a few days and are usually deposited while the flea is on the host, but are not glued to the hairs or feathers, as is the case with lice and some other insects. The human flea probably deposits most of its eggs while free from the host. The eggs usually fall from the animals in their nests; hence there is a tendency for the young and, of course, the resulting adults to concentrate in the vicinity of the sleeping places and most frequented haunts of the host.

The Larvæ.—Within from two to twelve days, depending on temperature and moisture conditions, the eggs hatch into minute, whitish, legless, and eyeless maggots. These are not parasitic, but move about actively in the dust and débris in or near the nest of the host. Under favorable conditions the growth of the larvæ is rather rapid. Flea larvæ usually molt twice.

The larvæ, or maggots, are slender, and each joint is provided with a number of hairs or bristles which assist it in crawling. The head differs slightly in appearance from the other segments and bears some of the usual head appendages with which most insects are supplied. These include short, stout antennæ, or feelers, and a pair of mandibles fitted for biting. The top of the abdomen is provided with two fleshy fingers which aid the larva in its movements, and a comb of fine hairs. When full grown the maggots are usually less than $\frac{1}{5}$ inch in length.

The Cocoon and Pupa.—When the larvæ have attained full size they spin cocoons of more or less oval shape. These vary from almost white to brownish, but owing to the particles of sand and dust usually attached the color is often dark.

Life-cycle.—The total period from the deposition of the egg to the emergence of the adult in the Pulex irritans, the human flea, ranges from nine to eleven weeks. The period is divided as follows: Length of the egg stage, seven to nine days; length of the larval stage, twenty-eight to thirty-two days; length of cocoon stage, thirty to thirty-four days.

Breeding Places.—In addition to having suitable hosts upon which the adult fleas may feed and thus produce eggs, it is essential that the eggs, the maggots which hatch from them, and the pupæ which finally again produce adults have favorable conditions for development. In houses these conditions are usually found in the cracks of the floors or under matting or carpets. Rat fleas often breed in numbers in granaries, barns, warehouses, and basements, particularly when these are not in constant use or when gunnysacks and rubbish are allowed to accumulate. The immature stages of "sticktight" fleas develop mainly in buildings, such as chicken houses, barns, and sheds which are inhabited by the principal hosts.

Dirt floors in chicken houses or sheds seem to be more favorable than wooden floors for flea development. The

young fleas may be found among the partially dried excrement, straw, feathers, and other waste in such situations.

The Human Flea.—The species of flea known scientifically as *Pulex irritans L.* has long been considered the human flea. It is to be found in practically every portion of the earth frequented by man. It is quite distinct from other fleas in structure, and is largely dependent upon man as a host, although in Eurpoe it seems to thrive on the badger, while in the United States it is commonly taken on the skunk. It has also been taken on hogs, rats, and various other animals, but these are usually

Fig. 7.—Human flea.

but temporary hosts and insufficient to maintain the species.

The Chigoe Flea.—The flea commonly known as the chigoe or "jigger" (*Dermatophilus penetrans L.* N. B.: This should not be confused with the "chigger" or harvest mite, which is the larval form of Trombidium) is related to the sticktight flea, but has different habits. Instead of remaining attached to the surface of the host, the female, after being fertilized, burrows into the flesh until it may become completely embedded. When it first reaches a host it feeds much as does the sticktight flea, the burrowing tendency becoming evident only when the

eggs are developing. A number of hosts are attacked, particularly the hog. Cats, dogs, cattle, sheep, horses, and even birds are attacked, but attention has been directed to the species largely through its infestation of man. Its attack is usually confined to the feet of the host, and in man particularly to the toes. The females may enter between the toes or under the toe-nails, and severe inflammation often follows, with the formation of ulcers, frequently resulting in permanent crippling. While in the host the eggs develop within the female and the abdomen becomes greatly distended, often attaining the size of a small pea. The legs of this species are not large, and when this distention takes place they, as well as the head, become very inconspicuous.

The eggs are deposited while the flea is attached and may drop from the wound or pass out with the detached flea. So far as known the rest of the life-history is similar to that of other species.

Destruction of Fleas on Hosts.—Certain creosote derivatives, among them creolin, have been used with excellent results. There are several preparations similar to creolin which would probably be equally effective. It is best to make up a 3 per cent. solution of creolin, or one of the similar preparations, in warm water in a tub and place the animal in it; then with a stiff brush to work the solution into the hair. The animal should be kept in the solution five or ten minutes, particular care being taken thoroughly to wet the fleas which crowd to the head of the animal. After the host has been thus treated the creolin water may be drained off and the animal washed with warm water and soap. This washing is not always necessary or advisable in treating dogs, but it is desirable with cats.

Ticks.—Ticks belong to the family *Ixodidæ*. They have an unsegmented body with eight legs in the adult stage and six legs in the larval stage. In some of their habits they resemble bedbugs. So far as is known, they take

no vegetable food, but live on blood. They frequently hang tenaciously to the skin, in which they partly bury themselves. If covered with oil or vaselin, thus closing their breathing pores situated behind the fourth pair of legs, they may be induced to release their hold. If pulled off roughly, the head is likely to break off and remain in the skin. Sulphur in some form is useful to destroy ticks in their adult stage. Sulphur ointment is particularly obnoxious to this group of parasites. Arsenic and crude oil also act as poisons to the ticks and may be used by local application.

The life-cycle of the tick consists of from four to six stages—egg or embryo, larva, nymph, and adult. The eggs are invariably deposited on the ground in large

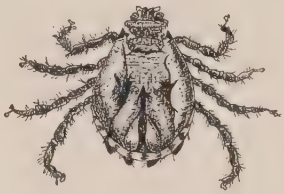

Fig. 8.—Cattle tick.

masses. The larvæ which emerge from the eggs are minute six-legged creatures. The larvæ attach themselves to a suitable host upon which they feed, then usually drop to the ground and molt, becoming nymphs. The nymphs have eight legs. The nymph waits until it can attach itself to a host, engorges blood, and drops from the skin before it becomes adult. Ticks take two and sometimes four to five years to mature. They hibernate during the winter. They prefer shady places and are destroyed by sunshine. Ticks cause Texas fever, South African fever, Rocky Mountain spotted fever, and relapsing fever.

Bedbug.—Habits and Life-history.—The bedbug is normally nocturnal in habit and displays a certain degree of wariness, caution, and intelligence in its efforts at con-

cealment during the day. Under the stress of hunger, however, it will emerge from its place of concealment in a well-lighted room at night, so that under such circumstances keeping the gas or electric light burning is not a complete protection. It has been known under similar conditions to attack human beings voraciously in broad daylight. It usually leaves its victim as soon as it has become engorged with blood and retires to its normal place of concealment, either in cracks in the bedstead, especially if the latter be one of the wooden variety, or behind wainscoting, or under loose wall paper, and in these and similar places it manifests its gregarious habit by collecting in masses. It thrives particularly in filthy apartments and

Fig. 9.—Bedbug.

in old houses which are full of cracks and crevices, in which it can conceal itself beyond easy reach. As just noted, the old-fashioned, heavy, wooden-slatted bedsteads afford especially favorable situations for the concealment and multiplication of this insect, and the general use in later years of iron and brass bedsteads has very greatly facilitated its eradication. Such beds, however, do not insure safety, as the insects are able to find places of concealment even about such beds, or get to them readily from their other hiding places.

The eggs are white oval objects having a little projecting rim around one edge and may be found in batches of from six to fifty in cracks and crevices where the parent bugs

go for concealment. In confinement eggs may be deposited almost daily over a period of two months or more and commonly at the rate of from one to five eggs per day, but sometimes much larger batches are laid. As many as 190 eggs have been thus obtained from a single captured female.

The eggs hatch in a week or ten days in the hot weather of midsummer, but cold may lengthen or even double this egg period or check development altogether. The young escape by pushing up the lid-like top with its projecting rim. When first emerged they are yellowish white and nearly transparent, the brown color of the more mature insect increasing with the later molts.

During the course of its development the bedbug molts or sheds its skin normally five times, and with the last molt the minute wing pads, characteristic of the adult insect, make their appearance. A period of about eleven weeks was formerly supposed to be necessary for the complete maturity of the insect, but under favorable conditions of temperature and food it was found that there was an average period of about eight days between moltings and between the laying of eggs and their hatching, giving about seven weeks as the period under these conditions from egg to adult insect. The molting periods are shorter in the earlier stages and lengthen in the later stages. There are many exceptions, however, and some individuals even under the same conditions remain two or three weeks without molting. Under conditions of famine, or without food, as already shown, the bedbug may remain unchanged in any of the immature stages for an indefinite time, and the checking of development by such starvation may result in additional molting periods.

Breeding records indicate that ordinarily but one meal is taken between molts, so that each bedbug must puncture its host five times before becoming mature, and at least once afterward before it can develop eggs. Additional meals between molts may be taken under favoring cir-

cumstances, however, and particularly when the insect has been disturbed and has not become fully engorged at its first meal after a molting or other period. The bedbug takes from five to ten minutes to become bloated with blood, and then retires to its place of concealment for six to ten days for the quiet digestion of its enormous meals, and for subsequent molting, or reproduction if in the adult stage.

Insecticides.—Sulphur is the standard insecticide. It may be used either as a gas or in powdered form—the flowers of sulphur. Sulphur dioxid is destructive to all forms of life. It will kill mosquitoes, flies, fleas, roaches, bedbugs, and all kinds of vermin, including rats and mice. Yet sulphur dioxid, which is very useful as an insecticide, is weak as a germicide. Because sulphur fumes injure fabrics and metal, the field of usefulness of sulphur is limited. Sulphur dioxid may be produced by burning sulphur (2 pounds of sulphur are burned for each 1000 cubic feet of air space), and an exposure of two hours is sufficient to kill mosquitoes, flies, and other insects in a small tight place. Three or 4 pounds and an exposure of six hours are sufficient for rats and mice. If the space is large or leaky, the amount of gas should be increased and the time of exposure prolonged.

In contrast to sulphur, formaldehyd, which is most important as a germicide, is a feeble insecticide. The gas seems to have no effect whatever on roaches, bedbugs, or insects of this class even after prolonged exposure.

Sulphur dioxid or sulphur in the amount of 8 grams will kill bedbugs in a space of 800,000 c.c. of inclosed space. This is used as the standard or unit of comparison for all insecticides. Formaldehyd, 40 per cent. solution, requires over 40 grams to kill the same bedbug under the same conditions, while pyrethrum requires over 80 grams. It is usually burned, however, in the proportion of 1 pound to the 1000 cubic feet of air space. But even in this strength pyrethrum has only the effect of stupefying the insects, so that they must be swept up and burned.

As a spray for insects and fungi among plants the arsenate of lead mixtures are fairly good. This is arsenate of lead, 5 per cent. strength, 4 ounces; acetate of lead, 11 ounces; water, 100 gallons.

Another spray is the arsenate of lime—white arsenate, 2 pounds; sal soda, 8 pounds; water, 2 gallons. Boil until the arsenate all dissolves—about forty-five minutes. Make up the water lost by boiling and place in an earthen dish. For use take 1 pint of this stock, 2 pounds freshly slaked lime, and 45 gallons of water, and spray.

Bordeaux mixture: Copper sulphate (blue vitriol), 4 pounds; unslaked lime, 4 pounds; water, 25 to 50 gallons. Dissolve the copper in hot or cold water, using a wooden or earthen vessel. Slake the lime in a tub, adding the water cautiously and only in sufficient amount to insure thorough slaking. After thoroughly slaking, more water can be added and stirred in until it has the consistency of thick cream. When both are cold, dilute each to the required strength and pour both together into a separate receptacle and thoroughly mix. Before using strain through a fine mesh sieve or a gunny cloth; the mixture is then ready for use.

CHAPTER II

PNEUMONIA—PLEURISY—INFLUENZA

Pneumonia

Among the communicable diseases acute lobar pneumonia easily ranks first. In the United States in 1925 the rate of mortality per 100,000 was 93.5. Of the other respiratory diseases, measles had only 2.3, scarlet fever 2.7, whooping-cough 6.7, diphtheria and croup 7.8, influenza 29.6, tuberculosis (all forms) 86.6. And typhoid fever, which has usually headed the list of communicable diseases, caused only 8.8 deaths per 100,000 in the United States in 1925.

That this mortality from pneumonia is not spasmodic or a recent development is shown by the statistics since 1900:

1900, 180.5	1915, 133.1	1921, 88.3
1910, 147.7	1916, 137.8	1922, 102.1
1911, 133.9	1917, 150.5	1923, 109.0
1912, 133.4	1918, 286.2	1924, 98.2
1913, 132.6	1919, 123.5	1925, 93.5
1914, 127.3	1920, 137.3	1926, (Cities 145.)

That congestion of the population has something to do with this mortality is shown by the ratio between the mortality from pneumonia in the cities and in the country. For example, in the census reports of 1923 the state of Pennsylvania has a rate of 156.8, while Pittsburgh has 328.2. Missouri has a rate of 120, while Kansas City has a rate of 142.4. Colorado has a rate of 112.2, while Denver has a rate of 140.8. The lowest rates among the cities were from those on the western coast, but the same

ratio holds good. Even Minnesota, with its low rate of 73.8, has from the cities, Minneapolis and St. Paul, 104.2.

In 1925 there were 1,219,019 deaths from all causes in the registration area of the United States—that is, a rate of 1182.3 to 100,000. Of these deaths, 96,482 were due to pneumonia—a rate of 93.5. That is, one in every eleven and one-half deaths was due to pneumonia.

These statistics justify us in thinking that as the modern movement of the population toward the cities advances deaths from respiratory diseases tend to increase, while the deaths from diseases communicated through food or insect bites tend to diminish.

Age.—Pneumonia may occur at any age. The rate of incidence (*i. e.*, the number of cases) is rather high up to the sixth year, but the mortality is low. At the other extreme of life both the rate of incidence and the rate of death are high.

Sex.—In adult life men are more subject to pneumonia than women. This is probably due to the exposure suffered by the males in their occupations.

Race.—Pneumonia is much more fatal to the negroes than to the whites. This is probably due to the fact that the whites have acquired a partial immunity.

Seasons.—In the temperate zone the late winter and the early spring are the seasons in which pneumonia is most apt to occur.

Thus, in a tabulation of 1501 cases, the incidence was:

First quarter of the year,	36.2 per cent.
Second quarter of the year,	30.7 "
Third quarter of the year,	12.1 "
Fourth quarter of the year,	20.8 "

This probably was due to the chilling of the body and the lowering of its resistance that so frequently occur at that time of year and that make possible the growth of bacteria usually present in the nose and throat.

Housing Conditions.—Bad ventilation, dark rooms, and overcrowding increases the incidence of pneumonia. This

is probably the reason why city dwellers are more often victims of pneumonia than those who live in the country.

Epidemics.—While pneumonia is for the most part a characteristic of individual localities (*i. e.*, "endemic"), still occasionally it reaches a virulence that causes it to spread widely over many localities and it becomes epidemic. In other words, while organisms more or less constantly present in the nose and throat may be responsible for a great number of the cases of the disease, still every now and then occur cases due to organisms of special virulence which are transmitted from person to person.

Bacteriology.—An inflammation of the lungs may be caused by different organisms, but the typical attacks of lobar pneumonia are caused by a group of cocci which appear under the microscope in pairs, and are, therefore, diplococci. They are called, because of their frequent connection with pneumonia, "pneumococci."

An intensive study of these organisms has shown that they may be grouped into four types, differing in frequency of occurrence and virulence. Thus the Rockefeller studies showed a percentage of frequency and death as follows:

Type I incidence (or frequency) 35 per cent., mortality 25 per cent.
Type II incidence 33.5 per cent., mortality 29 per cent.
Type III incidence 9 per cent., mortality 45 per cent.
Type IV incidence 21.5 per cent., mortality 12.5 per cent.

That is, Type III is the most virulent, but, fortunately, the least common. It is the one, however, that is found in epidemics of unusual virulence.

Ordinarily, even healthy persons harbor in their noses and throats both pneumococci and streptococci. The lowering of the body's resistance is all that is needed to produce an active disease.

Of these types, Type I is the only one for which a successful serum has been made. This gives some practical advantage to the typing of the organisms found in each case.

Methods of Transmission.—It has been definitely shown that particles of sputum will carry bacteria 5 to 6 feet when projected from the mouth by a cough or forced breathing. On the other hand, quiet breathing does not carry them to any appreciable distance from the mouth. This experimental phenomenon was verified in the late war when it was shown that a great share of the diseases prevalent in the cantonments were propagated by this droplet infection, and it was found possible to prevent

Fig. 10.—View of a pneumonia ward in a general hospital with sheets hanging at the bedside to prevent droplet infection.

such transmission by using screens and separating patients beyond the 6-feet limit. So in pneumonia, it is the spray from the mouth of the patient that serves to transmit the disease in most cases. Of course, it is to be understood that the sputum itself and other excreta will also carry the disease. But in these days the urine and feces of such patients are carefully sterilized and destroyed, so that in civilized communities it is the droplet infection that is to be feared.

In hospital wards it is wise to have a sheet, at least, between each two beds. These sheets may be suspended on wires from the corners of the bed-posts (as illustrated in Fig. 10), or they may be strung on wires from the ceiling (as illustrated in Fig. 11). Many patients resent this isolation, and will pull the sheet away from their face

Fig. 11.—Separation of beds by curtains strung on rods.

and cough, and laugh, and sneeze into the neighboring bed with what is apparently a determination to infect the neighborhood. Nurses need to be on the alert, therefore, in the pneumonia wards.

Mortality.—We have noted already that the mortality among the weak and aged is greater than that among

the young and vigorous. We have said also that the type of infecting organism also influences the result.

The cause of death is most commonly heart failure, but occasionally we find patients succumbing to the suffocation produced by the lack of breathing space, and

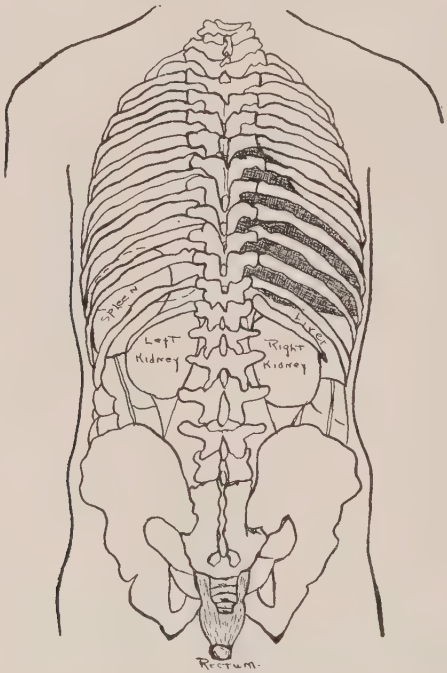

Fig. 12.—Posterior view of the chest to show the usual location of the pneumonia.

others dying from the general toxemia (*i. e.*, the poisoning of the vital centers from the products of the bacteria).

Morbid Anatomy.—Acute lobar pneumonia is a generalized infection with a local manifestation. That is, the bacteria may be found in other organs of the body and also in the blood.

The course of the disease may be divided into three stages: First, the stage of engorgement; second, the stage of red hepatization; third, the stage of gray hepatization. During the stage of engorgement the affected part of the lung is deep red in color, heavier than normal, and often slightly edematous. During the stage of red hepatization the portion of the lung involved in

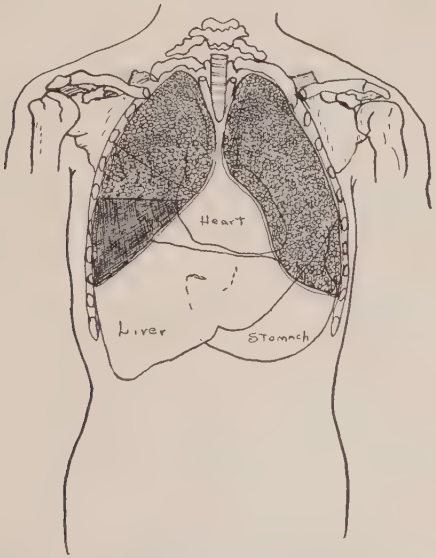

Fig. 13.—Anterior view of the chest to show the usual location of the pneumonia.

the process feels and looks like liver. The lung is swollen and heavy and pits on pressure, is readily friable and easily broken, is completely airless, and the excised portion sinks in water. The air-cells are filled with a coagulated exudate in which there are epithelium, red blood-cells, and leukocytes. In the stage of gray hepatization the cut surface of the lung has a mottled appearance. It is swollen and

firm to the touch and is more friable and more easily torn than in the preceding stage. The overlying pleura is dull instead of glistening and is covered with a fibrinous exudate. Usually there is some effusion in the pleura. Under the microscope the air-cells of the lungs are seen to be packed with leukocytes, while the fibrin and the red blood-cells seen in the preceding stage have largely disappeared.

Each of these stages frequently lasts two to three days, but the whole process may end in two to three days instead of being prolonged for the usual week or two.

The lower lobes of the lungs are the parts most frequently affected, and the right lower lobe more often than the left.

There is usually more or less of a bronchitis accompanying pneumonia and the bronchial lymphatics are always swollen.

The pleura is always involved and we find all stages of exudation—from the presence of the simple straw-colored fluid to an empyema where there is real pus in the pleural cavity.

There is usually pericarditis (or inflammation of the sac containing the heart) which is, however, very difficult to diagnose during life. In the cases of influenzal pneumonia the pericardial fluid is bloody and acid. An endocarditis (or inflammation of the lining and valves of the heart) is also frequently found.

Meningitis is not infrequent and occurs particularly in those cases where the infection is in the upper lobes of the lungs.

Resolution.—Recovery is attended by a breaking up of the fibrin and by a fatty degeneration of the leukocytes. The lung becomes small, has a boggy feel, and the pleura becomes relaxed and is thrown into folds. The softened exudate is removed partly by being expectorated and partly by absorption. Absorption of the exudate is probably of more importance than its removal by ex-

pectoration because the exudate disappears readily in cases in which cough and expectoration are entirely absent. The dissolving of the exudate is a process of digestion (or "autolysis").

Course of the Disease.—Acute lobar pneumonia usually begins with a chill or, at least, a sudden rise of temperature to 104° F. or thereabouts. It may drop next day a degree or so and then run steadily at that temperature during the remainder of its course, which varies from five to eleven days. A large minority, however, of the cases start with a gradual rise in temperature following a few days of malaise. In either case the fever usually terminates by crisis, wherein the temperature falls to normal or below within a few hours. This spectacular ending of the disease has caused the word "crisis" to become popularized and to signify somewhat loosely the deciding point in disease in general. For it cannot help astonishing the observer to see the patient, who has been tossing and moaning for hours, whose face has been flushed or cyanotic, whose respiration has been twice the ordinary rate, and whose breathing has been almost in gasps, suddenly become quiet and fall off into peaceful slumber, the body becoming bathed in perspiration, respiration becoming quiet, and the temperature reaching normal.

The danger of the crisis comes from the exhaustion of the heart after the long and stormy course of the disease. There is needed, therefore, special watchfulness and readiness to use stimulation at this point in the disease.

Pain.—Pain in pneumonia is due to the inflammation and stretching of the pleura. Consequently, it is not always present. It usually continues until the pleura becomes bathed in a fluid exudate and the rubbing surfaces separated. Occasionally, however, a case may run on for days without developing an exudate sufficient to allay the pain.

Cough.—Cough is usually present and is due to the irritation of the mucous membranes of the bronchi by

the inspired air. It, therefore, is best relieved by soothing vapors which penetrate the bronchi and quiet the nerve endings.

Sputum.—The sputum is at first rusty (due to the presence of changed blood) and sticky. As soon as resolution sets in, it becomes creamy and purulent, and usually more abundant.

Pulse.—During the first few days of the disease the pulse is typically strong and full. This is due to the stimulation of the fever. When, however, the heart begins to fail the pulse becomes more rapid, and weak, and thready. The blood-pressure, therefore, has to be watched and the heart kept under control from the very beginning. When the systolic blood-pressure falls below the pulse-rate the patient is in danger of collapse.

Blood.—The blood shows a leukocytosis if the patient is vigorous and has a fair chance of recovery.

Urine.—The urine usually shows some albumin and a concentration of urates and phosphates.

Digestion.—Most patients suffering from pneumonia exhibit a lack of appetite, sluggishness of the bowels, and flatulence. There may be even abdominal pain sufficient to cause the physician to look for intra-abdominal inflammation.

Treatment.—The first requirement is fresh, cool air and a quiet room. The windows should be open and the patient protected from drafts by screens. The temperature of the room should be kept even and in the lower sixties if the outdoor temperature will permit it. Visitors should be excluded and all noises and other causes of irritation removed.

The second necessity is comfort and rest. The bed must be the most comfortable obtainable. The patient must not be allowed to rise even to go to the toilet or use a bedside jar without special permission from the physician. He should not have to toss about the bed, but should be made comfortable in whatever position is best

suited to the case—as half-way raised in cases of dyspnea, or on one side in cases of pleurisy. The cleansing baths should be given without disturbing him in any way. Heat may be kept over the painful pleurisies, and cold may be applied to a palpitating heart.

The cough is kept under control by keeping the air of the room moist with steam charged with some soothing vapor such as that from the compound tincture of benzoin. If this fails, morphin will help.

The heart is controlled with digitalis in full doses until the pulse begins to show its effect (a full, slow, strong pulse at about 70).

If the air of the room is kept clear and fresh, yet without drafts, the "pneumonia jacket" will not be needed. But if the temperature cannot be kept uniform, some sort of protection may be kept over the chest to protect the skin from drafts and sharp temperature changes.

The diet should be stimulating, but should not be in the form of heavy meals or rich food. Fruit juices, broths, milk, chocolate, etc., may well be given every two to four hours.

The bowels should best be emptied at the onset of the disease with a brisk cathartic, and thereafter left alone except for such relief as is demanded for flatulence and distention, and for this enemata are usually sufficient.

Oxygen.—The tendency of the last few years is to extend the use of oxygen in pneumonia. Therefore, at the beginning of the disease, it is wise to provide several tanks of oxygen, with tubing, and either a mask for the face or a soft-rubber catheter for carrying oxygen into the nostrils. Or, if available, a special oxygen tent should be provided.

The usual indication for the administration of oxygen is cyanosis. Consequently, as soon as we notice the cyanosis of the lips, fingers, ears, we begin the administration of the oxygen, letting the gas flow out just fast enough for the nurse to feel the current when she holds

the tip of the tube about 2 inches from her face. If the catheter is used, it should be anointed with vaselin, inserted carefully into a nostril for 1 or 2 inches. If the mask is used, care should be taken that it is not pressed too heavily upon the face and that the opening for the exit from the tube is placed directly under the nostrils. The administration of the gas should be continued until the cyanosis disappears. Then it is stopped until the cyanosis or dyspnea reappears. Then it should be started again. This means that it is necessary to have on hand a large quantity of the gas if this method of treatment is to be used at all.

For the heart failure and the pulmonary edema (shown by the rattling in the throat) the nurse can use some emergency treatment, such as a hypodermic of strychnin, 1/30 to 1/20 gr., or the inhalation of ammonia. She can also add to his comfort by raising the patient on the backrest so that the position is one of half-recumbency.

Prevention.—From what we have said above it is quite evident that an effort should be made to prevent pneumonia.

First of all, attention should be given to the proper housing of our people, especially in the cities. For example, it was found in the Panama Canal Zone that if the workmen were taken out of their barracks and scattered in cabins or huts along the canal zone the rate of incidence of pneumonia was greatly lessened. In the same way, if we can prevent families from being congested in the tenement districts of our cities, if we can see that each individual has a proper sleeping place with plenty of fresh air and sunlight, we shall be doing much to eradicate pneumonia as one of the plagues of the United States.

In another direction, if in bunk houses and barracks the same precautions are taken that the late war compelled the United States Army to take, we shall have less of respiratory infection. Such precautions are the erection of pulp board partitions between the individual bunks,

the placing of the sleepers head to feet, so that no sleeper has his nose and mouth within 4 or 5 feet of his neighbor's.

Then, too, we should remember that the use of the cubicle or sheets about the bed to prevent the spread of the disease when treated in wards or living rooms is worth while. (See Figs. 10 and 11.) All excreta should be disinfected before being thrown into the sewer or privy. Clothing and linens from the patient should be thoroughly disinfected by boiling before being put in the family wash or sent to the laundry.

Whenever pneumonia breaks out in any group of people, all the members of that group should have cultures made from the nose and throat to see if they are carrying virulent bacteria. And in any case it is wise to see that all contacts have their noses and throats thoroughly irrigated with some antiseptic fluid, such as an albuminate of silver in 10 to 25 per cent. solution. This should be done daily for several days, and should be done with sufficient quantity of the solution to wash out the postnasal space.

One of the common means for the spread of pneumonia is through carriers. That is, through persons who have developed an individual resistance to the bacteria, but who still carry the organisms in their noses and throats. For this reason it is wise in the presence of an epidemic to culture the throats of those convalescing from pneumonia to see if they retain any organisms of Type I or Type II. If such organisms are found, the patient should be isolated until they disappear. For those organisms are usually only temporary. Organisms of the Type IV class are quite persistent, although of less virulence. When Type III of the pneumococcus is found, extra precautions should be taken to disinfect the nose and throat and, if necessary, keep such a carrier isolated until the cultures are negative.

During the late war attempts were made to prevent the onset of pneumonia by the use of vaccines. The experiment was inconclusive, but yielded sufficiently good

results to encourage us to proceed along that line. Consequently, when a group of people is threatened by an epidemic, it might be wise to utilize such vaccines. This use of vaccines should be carefully distinguished from the curative use of horse-serum in combating active pneumonia of the Type I group. For the use of the serum is productive of only temporary and passive immunity, while the vaccine affords an active immunity of longer duration.

Pleurisy

Pleurisy is an inflammation of the serous membranes enclosing the lungs and lining the interior of the chest. The pleuræ form a closed sac with one layer attached to the outside of the lungs and the other to the inside of the ribs. Consequently, in every movement of breathing, they rub upon each other. In health this rubbing is painless and easy because the membranes are moist and lubricated by an appropriate fluid.

A good picture of what is meant by the pleural cavity is given by Dr. Ringer, as follows: "If the stopper is removed from a hot-water bottle and if the bottle is then rolled up so as to drive out all the air, and if then the stopper is tightly screwed in, it will be impossible to separate the two layers of rubber forming the hot-water bottle because of the pressure of the air from the outside. Yet it would be easy enough to figure to oneself a cavity within the hot-water bottle if only air or water can be gotten in between the two layers. It is in the same sense that the pleural cavity exists. Normally the layers are as close to each other as the sides of the hot-water bottle."

The inflammation of the pleuræ may be either dry or wet. In the former case the surface becomes dull and rough with threads of fibrin appearing and connecting the two layers of the pleuræ. In such a case, if one listens with his ear to the chest wall, he hears the crackle

of these surfaces as they rub the one upon the other. In the latter case there is an exudate of a straw-colored albuminous fluid into the pleural cavity and the rubbing surfaces are separated. Consequently, there is less pain in pleurisy with effusion than in the other type.

If virulent germs become localized on the inflamed pleural membranes, the exudate becomes purulent and the condition is known as empyema. This is accompanied by fever, usually of the remittent type.

Pleuritic exudates are usually located around the lower edges of the lungs and may be of such quantity as to compress the lung and push it upward and inward toward its root. Occasionally we find a pleuritic exudate in the pleural spaces which separate the lobes of the lungs (interlobar pleurisy). This type is hard to diagnose and still harder to find if one attempts to tap it with a needle. Again, the exudate may be walled off by adhesions of the pleural surfaces round about it, and we have then the loculated or sacculated empyema.

If the underlying pneumonia progresses favorably and there is no pus in the pleural sac, the formation of the exudate may cease and the effusion be absorbed of itself. If, however, pus is present and a frank empyema has developed, it is usually necessary to interfere surgically. Ordinarily, the physician attempts to locate the exudate and secure some of it with a hypodermic syringe for examination. And if an *x*-ray is available, he secures a shadow-picture of its location and extent. Then if it proves to be frankly purulent, a portion of a rib is resected, usually in the posterior axillary line, at the level of the seventh rib, and the parietal pleura opened and a drainage established by means of rubber tubes.

Sometimes, instead of excising the rib and opening up the pleural cavity widely, a needle is inserted and as much of the fluid drawn out as seems wise, and then some antiseptic dye-stuff injected into the cavity.

Before these surgical measures are put in force, ordi-

narily there is a time when the nurse can greatly relieve the discomfort of the patient by such treatment as the application of heat to the side by means of a hot-water bottle or an electric light. Or she can apply a mustard plaster or a clay poultice. Or, finally, the motion of the ribs may be reduced by strapping the chest with adhesive plaster. To be effective these straps must reach more than half-way around the body because they must find their support on the unaffected chest wall. They should be put on with the patient upright and should be tight enough to constrict the lower part of the chest. Consequently, unless there is need for haste, the nurse should leave this measure to the physician.

When the chest is tapped it is well to remember that the removal of a large amount of fluid is apt to produce a temporary bad effect on the heart. The nurse should, therefore, be ready to use aromatic spirits of ammonia, or oxygen, or morphin, as the conditions may require. At any rate, the patient should be supported by the nurse in a comfortable upright position while the physician is removing the fluid.

Finally, it should be noted that the streptococcic empyema, such as that which accompanied the pandemic of influenza, is frequently a cause of death. This complication of pneumonia, therefore, should be watched for and promptly treated. Its presence is to be expected when the initial fever of the pneumonia has subsided and there ensues a period in which the temperature begins to fluctuate and the patient's general condition fails to improve. In other words, in cases where the course of the pneumonia is unduly prolonged it is wise to suspect the presence of an empyema.

Bronchopneumonia

To be distinguished sharply from acute lobar pneumonia is bronchopneumonia—a disease usually secondary to some other disorder (such as influenza) and with a different course and a different morbid anatomy.

"Primary" bronchopneumonia is usually seen in children under two years of age. But even here it may be the continuation of a disease starting higher up in the respiratory tract.

The disease in individuals older than two years is usually "secondary," even if, as in the cases of senility, it is secondary to attacks elsewhere from organisms of very low virulence, such as those found in common colds and sore throat.

Secondary bronchopneumonia should be guarded against particularly in such acute infections as measles, diphtheria, and whooping-cough. In fact, the danger from the two latter usually rises from this secondary pneumonia. Bronchopneumonia also often follows an attack of acute bronchitis in that the process extends down into the smaller bronchial tubes to the air vesicles. Bronchopneumonia may occur in the course of chronic tuberculosis, when secondary organisms are added to the original tubercle bacilli.

Another type of bronchopneumonia is the septic type derived from some focus of infection elsewhere in the body; for example, acute inflammation of the middle ear, acute appendicitis with suppuration, acute inflammation of the fallopian tubes in the female, and infections of the bladder and kidneys, especially in the aged. In such cases the organisms seem to reach the lungs by way of the blood-stream.

In the aged and debilitated, again, even such diseases as heart disease, nephritis, cancer, diabetes, etc., may lead to bronchopneumonia. In such cases it is the bronchopneumonia that produces death—it gives the *coup de grâce*.

Finally, we find a bronchopneumonia due to the inhalation of dust or gases or even to the aspiration of food ("aspiration pneumonia"). Thus, if the larynx becomes anesthetic by the use of alcohol or chloroform, or in the course of uremia or apoplexy, various foreign substances

may be aspirated down into the bronchial tubes, and thus set up bronchopneumonia.

Morbid Anatomy.—Bronchopneumonia is nearly always distributed through both lungs. It consists of small areas of consolidation instead of the massive consolidation found in acute lobar pneumonia. These nodules are grouped about the bronchial tubes and may be so thick as to shut off the attached parts of the lungs, thus producing an airless (or atelectatic) area. The nodules or patches of consolidation vary greatly in size (from pinhead to walnut size). When the material causing the disease is very septic, as in aspiration pneumonia, small abscesses may result.

Bacteriology.—It is evident that bronchopneumonia may be caused by a great variety of organisms, and the course of the disease will vary very greatly according to which organisms are present.

Symptoms.—In the "primary" form in children we have a sudden onset with a chill or convulsion. The temperature curve then rises rapidly to its level of 102° to 105° F. and is continuous in type, simulating acute lobar pneumonia. Nervous symptoms may be so prominent that the doctor may suspect the presence of meningitis. Thus the child may be peevish, restless, sleepless, and delirious. Such an attack may end by crisis. Even though the physician may make out rather large areas of consolidation in the lungs, still practically all these cases in children under two years of age are of the lobular or bronchial type rather than lobar.

In the "secondary" form of the disease, such as we find with older children and adults, the fever begins gradually and there may be no period of apyrexia (freedom from fever) between the attack of the original disease and the onset of the pneumonia. The one simply shades over into the other. The fever in such cases is very irregular in its course and ends usually by a gradual fall (or lysis). The length of the fever may vary anywhere

from one to four weeks—its course and length and outcome depending on the general vitality of the patient. In the strong and vigorous the disease is of short duration; in the weak it is prolonged and obstinate. The respiratory rate is generally markedly increased when compared wih the amount of consolidation in the lungs. There is less pain than in lobar pneumonia, but the cough is much more marked. The sputum is not the rusty, sticky type found in lobar pneumonia, but is more of a thin mucous or mucopurulent type with occasional streaks of bright blood in it.

Cyanosis of the skin, especially of the tips of the ears, lips, and finger-tips, is apt to be present whenever the involvement is sufficient to embarrass the action of the right side of the heart. Fever blisters are not often present and there is more apt to be sweating during the course of the disease than in lobar pneumonia. Gastro-intestinal symptoms are usually prominent, and children refuse food, sleep poorly, and show other signs of general disturbance.

The **treatment** of bronchopneumonia is very similar to that of lobar pneumonia. In general, more attention is to be paid to treatment by inhalation and to the keeping of the air of the room charged with soothing vapors. In this form of the disease there is also need frequently (especially if the course of the fever is protracted) of using hot and cold packs over the lung area, thus producing a hyperemia and assisting the body to react to the disease. These packs are given usually by folding up a large bath towel and wringing it out in hot water, laying it over the back of the chest of the patient (who lies prone) and leaving it for three minutes. At the expiration of three minutes another towel wrung out in cold water (60° F.) is exchanged for the hot one and left for one minute. Then a hot towel is put on again for three minutes, then a cold one for one minute, and so on for thirty to forty minutes. Similar treatment may be used on the front of the chest

if the heart condition will permit. In such case one may place the packs on the front of the chest during the forenoon of the day and on the back in the afternoon.

In the acute cases the watching of the pulse is extremely valuable, for thereby the nurse can give timely warning to the doctor of a beginning heart failure. Not only the rate but also the character of the pulse wave should be noted. In other words, all the factors pertaining to the pulse should be kept in mind—rate, rhythm, force, tension, etc.

Influenza

When a disease attacks the whole civilized world at practically the same time we say that it is "pandemic," as opposed to "epidemic," which indicates that a disease is prevalent in sharply defined areas for limited times, and "endemic," which indicates that the disease is constantly present in some sharply defined areas. Such a pandemic occurred with influenza in 1917–18–19. It originated apparently in Europe (some believe in France) and spread rapidly through Europe and America. It attacked all ages and all stations of life, but the mortality from it varied greatly, being apparently dependent upon environment and external conditions.

This disease was present in the same way in 1889–91, when it started in May, 1889 in Bokhara (Asia), and was carried westward along the great caravan routes, reaching Moscow in September and Petrograd in October. Then, following the routes of trade and travel, it reached Berlin in November, London the middle of December, and New York by the end of the year.

Eighty epidemics have been chronicled since 1173; and fourteen pandemics since 1510. The last previous epidemics were in 1847–48, 1836 37, 1830–33, and so on back through the centuries. Some epidemiologists have endeavored to prove that the disease runs in a cycle of thirty-three weeks, but that only once in a generation does

it find sufficient susceptibility and virulence to produce the pandemic condition.

This last epidemic was favored by the war conditions with their concentration of both civilians and soldiers in cities and barracks. Its virulence gradually died out, so that in 1919, in the United States, there were only 84,113 deaths—that is, a mortality of 98.8 per 100,000; and in 1920, 62,097 cases—that is, 71 deaths per 100,000. The only state that showed a higher death-rate in 1920 than in 1919 was Missouri, where the death-rate was 97.1 in 1920 as against 77.5 in 1919.

Taking the interval from 1911–18 as illustrative of the ordinary mortality due to influenza between periods of epidemics, we find that the rate in those years was below 35. Contrasted with that, we have the following figures to show the sudden onset of the pandemic and its gradual loss in virulence:

	1918.	1919.	1920.
Registration area of the United States	300.8	98.8	71.0
Registration states of the United States	299.8	98.5	70.5
Cities in registration states	298.3	81.6	61.2
Rural parts of registration states	301.1	113.2	79.3
Registration cities in non-registration states	374.4	114.0	97.3
All registration cities	300.0	82.8	62.4

Thus it appears that the disease was as disastrous to the rural population as to the urban.

It has been estimated that there were 20,000,000 cases in the world as a whole in 1918 and 1919, with 10,000,000 deaths.

The usual point of attack is the respiratory tract. There are many cases in which the nervous system seems to be specially affected, and still others where there is a severe gastro-enteritis. Thus, in France, among the allied forces, it was quite the custom to use the term "three-day fever" when sending back patients suffering from influenza. Many of these suffered more from the diarrhea than they did from the fever and general ache.

"Influenza probably never kills. Death is always due

to some complication, usually pneumonia" (Rosenau). Consequently, where the patients can be put to bed and kept warm during the three days of the fever the results are good; but those who have been exposed to temperature changes, to infection, or to exhaustion during this period frequently contract some secondary disorder (which is usually pneumonia) which proves fatal in an alarming proportion of the cases.

The incubation period varies from four hours to perhaps four days. Rosenow's work with strains of streptococcus would indicate that the period of incubation might be even shorter.

The disease is transmitted directly from person to person (contact), probably through the respiratory tract and by means of droplet infection.

The most prominent symptom is the utter prostration of the patient. They usually complain that they ache all over. They may have sore throat or not; they may have the diarrhea or not; but in any case the generalized ache is present. The fever is usually irregular both in its type and the height of the temperature. It may end by crisis or lysis. Experience has shown that if the fever persists more than three or four days one must suspect the presence of a secondary complication.

The pulse is remarkably slow for the height of the temperature and for the amount of general disturbance.

The secondary pneumonia may be either the bronchopneumonia or a peculiar type of lobar pneumonia (called "influenzal" pneumonia). In fact, in some cases it appears at the postmortem examination as if both processes had been present. Consequently, there is still discussion as to the exact classification of the influenzal pneumonias.

The sequelæ of the disease are notable even where there has been no real pneumonia or other frank secondary disorder. Thus some patients have a persistent neurasthenia and psychasthenia; others have a colitis or enterocolitis; and still others have a chest condition which is hard to

distinguish from tuberculosis. Still more to be dreaded is encephalitis lethargica (q. v.) which may lead to years of invalidism, if not to early death.

Consequently, the important thing in the treatment of influenza is to get the patient to bed in a warm, well-aired room, isolating him from other sick people; forbid visiting; and see to it that every one who enters, including the nurses and physicians, take precautions not to carry the germs elsewhere (masks and gowns).

The symptoms are relieved if one gives at the beginning a dose of a brisk cathartic, such as 2 grains of calomel and with it 5 or 10 grains of acetyl salicylate (aspirin), every two hours for three or four doses. At the same time it is wise to cleanse the nostrils and throats of the patients with a strong solution of silver albuminate (such as argyrol or silvol).

After the fever has gone it is wise to keep the patient in bed for three or four days and then to allow him up only under the strictest control.

The diet should be chiefly water and easily digested liquids. If there is much diarrhea the use of bismuth subnitrate and tannin albuminate is helpful. The former may be given in doses of 20 grains every two hours; the latter in doses of 10 to 15 grains with each diarrheic bowel movement.

CHAPTER III

TUBERCULOSIS—PULMONARY MYCOSES

Tuberculosis

In 1925 the six most important causes of death gave the following mortality and mortality rates in the Registration Area, according to the United States Census Bureau:

	Heart.	Nephritis.	Pneumonia.	Cancer.	Tuberculosis.	Cerebral hemorrhage.
Deaths.....	191,268	99,320	96,432	95,504	89,268	87,064
Rate.....	185.5	96.3	93.5	92.6	86.6	84.4

It will be seen then that tuberculosis ranks next after pneumonia as a cause of death in the United States.

Bad as it is now it was still worse, because in 1900 the death-rate was 201.2 per 100,000 population. In 1920 it was 114.2. Consequently the 86.6 seems a very low rate by comparison. This change has been brought about by the definite campaign against tuberculosis in the United States. This is a campaign of education and also of treatment. The people have been educated to know the nature of the disease, to recognize its early symptoms, and to learn that it is curable in its early stages, and to learn also that the real treatment of the disease is through segregation.

To appreciate these figures we must remember that evidence of the prevalence of tuberculosis has been found in the history of all civilized races. It is not, then, a sporadic disease with varying degrees of extent and intensity, but one that has been constantly attendant upon the congestion of life in the cities in all parts of the world and in all eras of history. It is the more prevalent

the older the civilization and the denser the population. In the United States it had become so wide-spread that every ninth person died of tuberculosis. A realization of the gravity of the situation led to the organization of antituberculosis societies and campaigns of education among the laity. The results have amply proved that the disease is preventable and that popular education is a potent factor in its prevention.

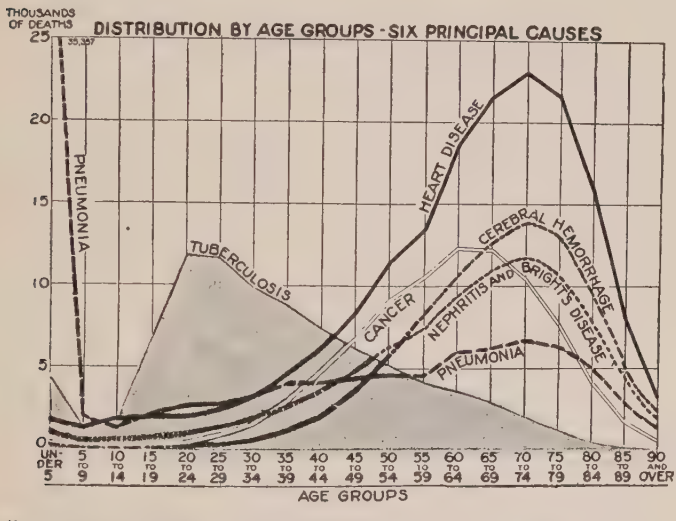

Fig. 14.—Deaths from tuberculosis and other principal causes—U. S. Registration Area, 1923. (National Tuberculosis Association.)

The prevalence of tuberculosis seems to be influenced by housing, occupation, age, and general health.

Thus insanitary dwellings with dark and crowded rooms increase the incidence of the disease. This is shown clearly on city maps on which pins are stuck to show the location of tuberculous patients. For the pins are crowded together over the tenement districts and the districts with poor sanitation, but are few and widely scattered

over the parts of the city where the people live in separate houses and with plenty of fresh air and sunshine. The same principle was demonstrated when Dr. Gorgas took the laborers of the Canal Zone out of their barracks and housed them in scattered shacks—to the great improvement of their health.

Investigation of the prevalence of tuberculosis in the dusty trades, and similar occupations for which a high mortality has been claimed, has shown the interesting fact that it is the housing rather than the trade that determines the health of the worker and his family. Of course, the conditions under which a man or woman works have an influence on his health, but it is these accompanying conditions of ventilation and housing rather than the precise nature of the work that favors the development of tuberculosis.

Tuberculosis makes its greatest ravages among young adults. The median age of death from tuberculosis is from twenty-three to thirty-three. Since death comes only after some years of sickness we must look for the outbreak of the disease in adolescence. Thus in the survey of the high schools of Cattaraugus County, N. Y., it was found that 1.3 per cent. of the pupils had either active or arrested pulmonary tuberculosis.

This same conclusion is reached when we study the records of postmortem examinations. For in the bodies of infants under three months of age we find no lesions due to tuberculosis. In those dying between three and twelve months we find tuberculosis lesions in 1.8 per cent. In the second year we find that the rate has jumped to 11 per cent.; in the third year to 16 per cent.; and in the fourth year to 23 per cent. At puberty we find that 75 per cent. of the bodies show evidence of tuberculosis. And at twenty-five years we expect to find some evidence of the presence of tuberculosis in practically every body examined.

We must conclude then that all of us who grow up in

modern cities have been infected with tuberculosis. The fact that so many never show any outward manifestation of the disease proves its curability. But, on the other hand, these figures would indicate that many live on for years with the smoldering embers of tuberculosis in their bodies and are, therefore, possible centers for the dissemination of the disease.

So many women die from consumption soon after giving birth to children that the puerperium is regarded as one of the danger-points in the fight against tuberculosis. In fact, marriage and child-bearing should not be entered upon lightly by a young woman with a history of tuberculous disease.

Etiology.—The factors of housing, occupation, age, exhaustion, and worry are merely favoring conditions. They are not the real cause of tuberculosis. This real cause is the tubercle bacillus.

This organism was stained and cultivated by Robert Koch in 1884. But its presence had been suspected by Lavaigne as early as 1852 and by Villemin in 1864. The scientific world, however, was not ready to accept the germ theory of disease until Pasteur's work in 1868–76 proved that life could not exist without antecedent life and that communicable diseases were due to living organisms.

The tubercle bacillus is a slender rod usually stained red in the microscopic preparation. This differentiates it from the other organisms in the field which are usually stained with the blue or violet stains. This staining peculiarity is due to the fact that the outer shell of the tubercle bacillus is of such a tough waxy nature that only mordant dyes such as the carbolfuchsin will penetrate it. And when such dyes have stained the bacillus the application of acid alcohols, such as decolorize other organisms, will not remove the stain.

The human tubercle will grow in guinea-pigs and other animals. But the other tubercle bacilli, such as those of cows (bovine), of birds (avian), and of turtles, grow with

difficulty in man. The only one of these of importance is the bovine organism, for this is found occasionally to be the infective agent in the tuberculosis of children.

The tubercle bacillus withstands drying. Consequently, it will live for months in dust and dried sputum. This makes the apartments of tuberculous patients—especially of those who have been careless in their personal habits—

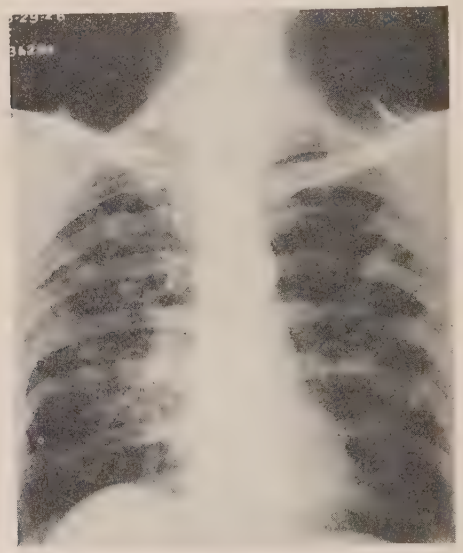

Fig. 15.—Tuberculosis of the lungs (Dr. David S. Dann).

dangerous for subsequent occupants unless the walls and cornices and corners have been most painstakingly cleaned.

The disease is spread chiefly by contact. The spray from the mouths of patients (droplet infection), the dust from their clothing and surroundings, the dust from the sputum on floors and pavements is breathed in by others and lies lodged on the membranes of the respiratory tract ready for development whenever the opportunity offers.

Tuberculosis can be spread also from the bacilli excreted in the feces and urine. This is an added reason for vigilance in the sanitation of our cities and villages.

The usual portal of entrance into the human body is through the respiratory tract. The germs in the dust, for instance, fall on the lymphoid tissue of the tonsils and then are absorbed by the lymph and carried to the nearest glands. After such become filled or weakened the bacilli enter the blood-stream and are deposited in various parts of the body. It would thus appear that the lymph-glands are the first to be attacked. And this is so uniformly true that in children the disease is typically limited to the lymphatic glands.

Later on, when the body has become sensitized to the bacilli and when the lymphatic glands have lost their protective power, the bacilli are able to pass the glands and attack other tissues.

Bovine tuberculosis is spread chiefly by the milk of infected cows. Of course, it may also be spread by infected and illy-cooked flesh of infected animals. But the strict regulation of stockyards has gradually eliminated this source of infection. The danger from infected milk emphasizes the need of the thorough inspection and control of dairy herds.

In the early days of pathologic anatomy tuberculosis in cattle was called by the Germans "Perlsucht" because the glistening white points resembled pearls. It was these same glistening white grains that led to the names tubercles and tuberculosis when the character of the disease was better understood. These "little mounds," or tubercles, are made up of giant-cells and the cheesy débris resulting from the breaking down of normal cells, surrounded by a wall of fibrous or scar tissue.

The process may be thought of thus: the tubercle bacillus attacks a cell, lives on its protoplasm, and produces rapidly daughter bacilli. The result of the excretion of their toxins and of use of the cell fluids is that the cell

structure breaks down and several cells coalesce. We find then several nuclei in one giant-cell. The irritation set up by this process causes the deposit of a wall of scar tissue about the tubercle, and it is these scar-tissue mounds that give the pearl-like appearance to a cut section of the tissue.

If the walls become hard and remain so, the process is halted. The presence, therefore, of old calcified tubercles indicates successful resistance to an attack. If, however,

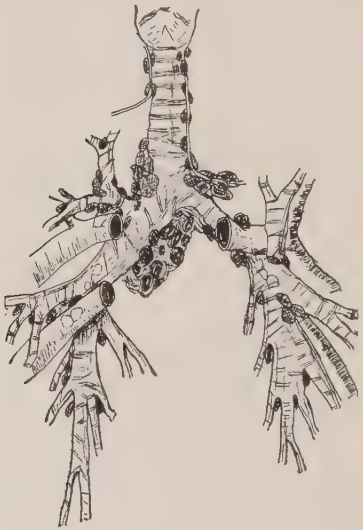

Fig. 16.—Peribronchial glands.

the walls become softened and the caseous material absorbed by the lymph and blood, there results a cavity in the tissue. Such cavities tend to grow larger because they represent an active and successful invasion.

When we examine the tissue of a patient dead with tuberculosis we usually find both cavities and calcified nodules—for the process is a slow one with changing success. It varies with the local resistance of the tissues and the general vitality of the patient.

In children, then, we find tuberculosis of the glands, especially of the cervical and mediastinal glands. In those parts of the world where cleanliness and fresh air are not the inheritance of every child, this tuberculosis of the glands results in the breakdown of the glands under the skin, especially those of the neck. This disease used to be called "scrofula" until its identity with tuberculosis was established.

Tuberculosis of the bones and joints is also a disease of childhood. Tuberculosis of the spine is also known under the name of Pott's disease. The drainage from these diseased vertebræ often works downward into the groin and forms there a large "cold" abscess. Hip-joints and knee-joints are also frequently attacked. The result of bone tuberculosis is a destruction of tissue, and the loss of function of the joints.

Tuberculosis of the skin is rare in America, but it used to be common in the countries about the North and Baltic Seas. It was called lupus ("wolf") because of its destructive nature.

Tuberculous meningitis—the inflammation of the membranes of the brain and spinal cord—represents a final stage in many cases in which the disease has existed for a long time in other tissues of the body.

Because of the swallowing of sputum containing tubercle bacilli tuberculosis of the bowels and other abdominal organs accompanies many cases of tuberculosis of the lungs. So also the excretion of tubercle bacilli through the urine causes tuberculosis of the kidneys and other genito-urinary organs.

When the patient's immunity or resistance to tuberculosis is practically zero the bacilli may attack any and all tissues at once. The result is called miliary tuberculosis, a fever hard to distinguish from typhoid fever. It lasts from four to twelve weeks and ends in death. The name is given it because the tissues of the body seem studded with millet seed (*i. e.*, small, shining tubercles).

But it is pulmonary tuberculosis that takes the largest toll in human life. As we have seen, the glands about the air-passages become infected first, and then, when the patient's resistance is low, the bacilli are allowed to reach the roots of the lungs. Thence they are driven by coughing or sneezing into the bronchi leading to the apices or tops of the lungs. So uniformly does tuberculosis begin in these apices that the name "apical catarrh" is practically synonymous with beginning tuberculosis. While the incipient or minimal tuberculosis of the lungs is the beginning of pulmonary tuberculosis, yet it should be remembered that this is secondary to tuberculosis of the glands, and that the body has already been poisoned (or sensitized) by the disease.

The Course of the Disease.—In order to secure uniformity in reports of the progress of the patients the National Sanatorium Association has defined the stages as follows:

(1) *Minimal.*—This used to be called the incipient stage. The disease is limited to a small part of one or both lungs and there are no severe constitutional disturbances. There may be a slight increase in pulse-rate. The expectoration is small in amount and may contain tubercle bacilli.

(2) *Moderately Advanced.*—The disease is more widespread—varying from one-third of one lung to all of one lung. No cavities are found. There is no marked impairment of the functions of the body.

(3) *Far Advanced.*—The disease has seized on more tissue; or cavities are found; or there are serious constitutional symptoms.

The progress of the patient is described in the following terms: The disease is (1) *apparently cured* when all constitutional symptoms and the expectoration of tubercle bacilli have been absent for two years, with the patient living under ordinary conditions of life.

The disease is (2) *arrested* when all constitutional

symptoms and the expectoration of tubercle bacilli have been absent for six months.

There is an (3) *apparent arrest* when no "activity" of the disease has appeared for three months.

The disease is (4) *quiescent* when the constitutional symptoms have disappeared for two months, though bacilli may still be present in the sputum.

A patient is (5) *improved* when the constitutional symptoms are lessened or are entirely absent. Cough and the expectoration of bacilli are usually present. There are the general symptoms of a stationary lesion.

Pulmonary tuberculosis usually is characterized at the beginning by weakness, fatigue, and loss of weight. Fever does not appear until later. The cough and expectoration frequently first appear weeks after the general feeling of malaise. Only the occasional case is attended with hemorrhage at the beginning. Consequently, we often see cases that have developed without any symptoms leading us to suspect the lungs.

After a few weeks there develops the hectic fever. That is, the morning temperature is normal or subnormal and the afternoon temperature may reach 100° F. The cough and expectoration become also established features at this time. The patient's complaint, however, is usually directed to the lack of appetite and the indigestion. The weakness, the rapid pulse, and the shortness of breath still increase in spite of the patient's protest that he is improving.

This optimism is quite characteristic of consumptives. They explain their malaise and bad symptoms by their bad surroundings. They frequently charge the doctor with bad management. If in a sanatorium they complain of the food and the attention they receive. It is so rare to find a depressed consumptive that an experienced physician suspects other troubles when such a depression occurs.

The night-sweat is characteristic of the moderately advanced case. This type of sweat occurs some hours

after the patient falls asleep and not early in the night, as does the sweating from nervous exhaustion. The sweats are the same as those found in cases of empyemas and abscesses and blood-poisoning. This would indicate that the cause of night-sweats in tuberculosis is the secondary invasion of the lung tissue by streptococci and other pus-forming organisms.

The disease goes on for months with the patient now better and now worse. Whenever a new method of treatment is tried the patient improves for a time. But gradually the strength diminishes, the fever range increases, the cough becomes more troublesome, the amount of sputum increases, and finally the patient dies. Sometimes the final cause of death is a real pneumonia, sometimes suffocation (lack of lung tissue), sometimes heart failure; but more often it is the extension of the disease to other organs that produces the fatal result. Thus the kidneys may be so affected that uremia intervenes, or meningitis may develop, or abdominal tuberculosis may hasten the end.

The **prognosis** of tuberculosis of the lungs varies according to the stage at which the case comes under definite treatment. Thus, in the minimal stage probably 50 to 75 per cent. of the patients may expect to recover. In the moderately advanced stage not over 35 per cent.; and in the far advanced stage none can really hope to recover. Because of this fact there is a great premium put on early diagnosis. This, of course, means that diagnoses must frequently be made on presumptive evidence, and that the patient is given the benefit of the doubt and put under aggressive treatment.

The **treatment** of tuberculosis demands, first of all, rest. As long as there is fever this rest means rest in bed. And even after some exercise is permitted, rest is still predominant and the exercise must be gradually introduced and strictly supervised. In this feature lies the success of sanatorium treatment—for in sanatoria the

rest periods can be enforced and the amount of exercise strictly graduated. This is of more importance than the administration of medicine.

Next comes food. Because of the deranged stomachs it is necessary to provide easily digested foods. And because of the wasting of the disease the amount of food must be all that the patient can assimilate. In general, one would say that the sufferers from tuberculosis require more food than healthy persons of the same size and weight. As a general principle it is wise to provide only three, or at most four, dishes at a meal, and then to give milk or eggs and milk between meals. The simple foods, such as steaks, oven-dried toast, custards, and mealy baked potatoes form a good basis for the dietary.

Third, the patient must have fresh air. If the sufferer can be put on a porch or out in a tent it is better than to keep him in a room. He must learn to like cold, fresh air. Drafts, of course, must be avoided, but this is usually obviated by the use of screens and blankets about the bed.

It is more important to have good care than to change climates. While the mountain climates usually provide purer and more invigorating air, still undue exposure in the mountains may be of more damage to the patient than remaining in the valleys in well-conducted sanatoria.

In other words, if a patient can afford to go to a good sanatorium in the mountains or on the seacoast, he should be sent there. But if going to the mountains or the seacoast means that he would not have scientific care, he would better go to a sanatorium in his own climate.

Next in importance is the care of the skin. The skin should be kept in vigorous condition by using the daily rub with cool water. This may be fortified by oil rubs. Hot tub-baths should be limited to what is needed for cleanliness. In giving baths we should remember that

the patient should not exert himself. Here again sanatorium life has its advantages in that such things can be cared for properly.

The cough does not need to be entirely checked. In fact, it is better to let the cough go without treatment than to give narcotics except when it causes pain or racks the body. But, as a matter of fact, the cough can be greatly alleviated by the use of medicated vapors without giving medicines that might derange the stomach or weaken the patient's morale. Then, again, the cough rarely troubles the patient who lies quietly in the open air.

The fever, also, is not attacked directly by febrifuges and depressants. Rather it is let alone and the stimulation of the body depended upon to overcome the inflammation that brings on the fever. If thought wise, guaiacol may be added to the oil for rubbing the patient, and this has both an antiseptic and febrifuge effect.

The night-sweats may be inhibited by using some of the atropin-like medicines; but under good conditions the sweats become of such slight importance that no special treatment is required.

Sleeplessness rarely bothers the patient after he has become quiet and relaxed. No special treatment is required except at the beginning of the treatment. Sometimes it is sufficient to give the patient a drink of warm milk to make him drop back to sleep.

Nausea and vomiting are better controlled by the diet and general care than by medicines. Sometimes the stomach-tube may be needed at the beginning to put the stomach into good condition to take food. Then again 15 or 20 drops of dilute hydrochloric acid in a glass of water may serve to enable the stomach to digest the food.

Hemorrhage, except in advanced cases, is rarely dangerous. The patient stops coughing up blood if he is stretched out flat and quieted by morphin or some other opiate. The drugs used for hemorrhage elsewhere, such as pit-

uitrin and adrenalin, are of no use in hemorrhage from the lungs.

Vaccination with extracts of tubercle bacilli has been tried since it was introduced by Koch in 1891. But the success has been so indifferent that it can be regarded at best as only an adjuvant to the general sanatorium treatment. Similarly the use of "specific" treatments, such as that with a gold salt (sanocrysin), has proved to be practically useless.

Pneumothorax is the condition when air finds its way into the pleural cavity. This allows the lungs to collapse. Pneumothorax is artificially produced when the physician wishes to put a lung or part of a lung at rest. In such cases air or nitrogen is introduced carefully through a needle into the pleural space until the pressure is just the same in the lung and outside it. The tendency is for such gas or air to be absorbed. In such cases repeated injection of the air is needed to keep the lung at rest. Such treatment relieves the patient of much of his cough and dyspnea. Here again this treatment is only an auxiliary to the general sanatorium treatment.

The **prevention** of the disease calls for educating the public in both individual and community prophylaxis.

Individual prophylaxis applies to the prevention of the spread of the contagion from individual patients and to the inculcating of "health habits" in the homes of the people. It involves the matter of the care of the sputum, spitting on the floor or ground, coughing or sneezing in the faces of other people, etc. These matters seem elemental, but apparently many patients either through ignorance or selfishness constantly violate the laws of hygiene with regard to these matters. It is best to have the sputum burned. The paper sputum cup facilitates this. Spitting into toilet paper wads or into cloths is less sanitary than to use the cups because of the liability of drying out the sputum and permitting it to be spread into the air.

A French sign in the street cars of Limoges reads, "He who spits on the ground attempts the life of others." This idea should be impressed thoroughly on the mind of every consumptive.

And then coughing or sneezing into the air even if no one is about simply disseminates millions of bacilli in the air of the room. Therefore, one of the first lessons should be always to cover the mouth when coughing or sneezing.

Individual prophylaxis has another side, and that is the teaching of young children to guard themselves against the attacks of tuberculosis. The campaign to educate children to health habits has been successful in America to the extent that children are learning to like to sleep in the open air, that they like plenty of baths, especially the cool shower-baths, that they brush and clean their teeth, and that they cover the mouth when coughing. The parents, too, are learning that these things not only do not injure their children, but that they even make them stronger.

Community prophylaxis demands that patients with open cases of tuberculosis be prevented from infecting others, that curable cases be treated promptly and properly, and that the patients with incurable cases be given every possible comfort under conditions that will not spread the disease.

To bring about these desirable results there should be available to every community three institutions: a dispensary, a sanatorium, and a hospital.

At the dispensary there are three types of services, or persons—the doctor, the nurse, and the social worker. It is difficult to combine the three or even any two of these services in one individual, and all three services are needed. For the doctor diagnoses the condition and outlines the plan of treatment, the nurse visits the homes and sees that the plans are carried out, and the social worker seeks to bring about the proper disposal not only of the patient but also of his entire family. Thus, whenever a

person is found suffering from a disorder resembling consumption, he is brought to the clinic for examination. If a diagnosis of tuberculosis is made, the social worker investigates the economic conditions of the family and the best plans for the maintenance of the group during treatment. The nurse visits the home and brings all the contacts (all persons who have been associating with the patient) to the dispensary for examination.

Advanced cases should not be sent to sanatoria where the incipient or curable cases are being treated, because it spoils the morale of the sanatoria and because the sanatoria in general are not equipped to handle the complications that go with advanced tuberculosis. The problem of caring for these incurables has received much thought during the last years. And the general result of this thinking is that such patients are sent to the general hospitals and put in special wards where they may have light and air, and proper attention to the various complications that arise from time to time. We find that they do not spread the infection among the nursing personnel, or among other patients, if the primary conditions of good hygiene are observed in these hospitals. These simple statements are important, because the disease is now being spread in the cities of the United States by the advanced or incurable cases that are being sent home and allowed to die in their family circles. From the standpoint of community health, therefore, it is important that greater emphasis be placed on the care of these advanced cases than has been given hitherto. The dislike of nurses and doctors to care for advanced cases of tuberculosis should not be allowed to weigh against the general welfare of the community, or lead to their not being segregated and cared for properly in the general hospitals.

If the case seem curable the patient is sent to the sanatorium for treatment (for a period lasting from six months to two years). If the case seem incurable the

patient is sent to the hospital, where he may be kept in comfort until he dies.

When the disease is arrested the patient is sent back not to his home, but to the dispensary, in order that proper supervision may be maintained while the ex-patient is readjusting himself to life. In connection with the sanatorium and also the dispensary a department of

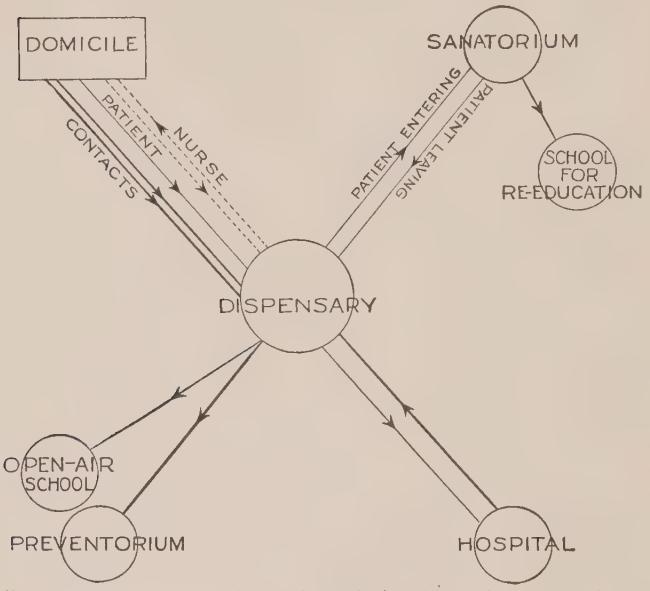

Fig. 17.—Diagram to show the relationship of community institutions.

occupational therapy should be provided to assist these graduates of the sanatorium to help pay their way and also to occupy their minds.

Now the problem of preventing the spread of tuberculosis centers about the care of the contacts. This is especially true of the children in the homes in which there is or has been a case of open tuberculosis. They, of

course, show no positive symptoms of the disease. But they are infected. Whether they will go on to develop tuberculosis or not will depend on the care they receive during the next few years following this period of exposure.

The ideal plan is to take them away from these homes and infected surroundings and place them out in the open country under conditions that will foster their general health. The French use such a system extensively and the results have been excellent.

In the United States the best solution of the problem yet offered has been to place such children in open-air camps ("preventoriums") where their lives will be regulated and they will be given educational facilities.

Where the preventorium has not been developed, the open-air school is the next best choice. Here the children are kept in the open air, they are given regular sleeping periods during school hours; they are given extra food both in the forenoon and afternoons; they are taught to take daily cold baths; and their temperatures and weights watched from day to day. It is interesting to observe that such children keep abreast of the children in the regular rooms in academic work and steadily gain in health and strength.

In cities where there are no sanatoria or hospitals available some of the ravages of the disease may be checked by organizing in the dispensaries classes for the instruction and care of the tuberculous. With the aid of visiting nurses the dispensary physicians are able to raise the standards of hygiene among these patients; and while they cannot show the cures that the sanatoria offer, still they do show good results in the comfort of the patients. Such patients are taught to care for the sputum properly, to prevent droplet infection, to use separate eating utensils, to wash their hands frequently, and care properly for their body and bed linen.

The following fourteen points, worked out by the International Congress of Tuberculosis in 1926, make a

good summary of the present knowledge of the treatment of this disease:

1. There is no specific cure for tuberculosis (like antitoxin for diphtheria).

2. There is no specific preventive for tuberculosis (like vaccination for smallpox).

3. Among the important factors in the cure of active tuberculosis are:

(*a*) Competent medical supervision.

(*b*) Complete rest under favorable conditions.

(*c*) Carefully balanced and adequate nourishment suited to the individual.

(*d*) Abundance of open air and, if possible, of sunshine.

(*e*) Relief from other infections, or other physical or mental strains or handicaps.

4. Among the chief factors in the prevention of tuberculosis are: Finding existing cases of tuberculosis, and in each instance bringing the patient under treatment suited to his condition; teaching him how to avoid the infection of others; examining contacts, and securing suitable treatment of actual or potential cases of tuberculosis among them.

5. Another important factor is the searching out of those persons who, by reason of their physical condition, their occupation, or for other reasons, are likely to be especially susceptible to tuberculosis infection, such as seriously underweight children, undernourished adults, who are recovering from other diseases, or are subject to excessive fatigue, and persons who have a healed tuberculous infection, and securing for each of them such advice, treatment, assistance and relief as will minimize the likelihood of the development of tuberculous disease on their part.

6. The general education of the people of every community as to the measures involved in the prevention of tuberculosis, and as to the curability of tuberculosis in its earlier stages is of the utmost importance.

7. The hospitalization of advanced cases of tuberculosis when home conditions are not readily subject to efficient management is an important means of care of the patient and of preventing the spread of infection.

8. The medical supervision and economic rehabilitation of patients discharged from sanatoria demands particular attention.

9. Tuberculosis is often associated with undernutrition, and all steps leading to the discovery and proper treatment of undernourishment among children and adults contribute to the prevention of tuberculosis.

10. Medical students should receive adequate training in the diagnosis, treatment, and prevention of tuberculosis. There should be made available for all physicians in general practice an apportunity for intensive study and observation in the diagnosis of tuberculosis; and they should also be made available in every community, as needed, the services of those already highly expert in the diagnosis and treatment of tuberculosis.

11. While it is impossible to measure the exact effect of the various steps taken by communities for the prevention of tuberculosis, such as more intensive medical provision for diagnosis and care, public health nursing in the homes of the tuberculous, sanatoria and hospitals, public health education concerning tuberculosis, the supervision of the health of industrial workers, and similar steps, there is no reason to doubt that these measures have played an important part in bringing about the reduction in tuberculosis mortality, which has occurred practically everywhere.

12. There is every reason to believe that by a continuance and a further intensification of the measures for the prevention of tuberculosis as now understood the present rate of decline of tuberculosis can be continued and increased.

13. We believe that the time has come to include in the tuberculosis program the attack upon certain associated community health problems, such as child welfare

and cardiac disease, provided that the program for the application of existing knowledge in relation to the prevention of tuberculosis is well organized and fully maintained.

14. We believe that the deepening interest in the investigation of the causes, treatment, and prevention of tuberculosis should be encouraged and developed.

The Preparation of Nurses for Tuberculosis Work.—That workers with tuberculosis need special training has become increasingly evident, and the various organizations have tried to point out the needs and the methods of meeting the needs. Thus, the chapter on Tuberculosis from the Manual of Public Health Nursing by the National Organization for Public Health Nursing; the chapter from Tuberculous Workers, by Philip P. Jacobs, Ph. D., of the National Antituberculosis Association; the Education in Tuberculosis for Student Nurses, prepared by a committee of the National League of Nursing Education; and the standards put out by the various nursing associations—such as that of East Harlem—all point to this need, and all indicate the methods by which the needs may be met. It would be wise, therefore, for the nurse who contemplates this work to have those chapters at her disposal. Summarized, these publications emphasize the need of the nurses being prepared to do several things which partially belong to the nurse and partially to the social worker. Thus, she has to see to it that the patient is instructed in the nature of his disease, the type of cure, and the methods of preventing his infecting others. The family has to be instructed along the same lines, and to avoid kissing and other things that might spread the disease. The community has to be instructed so that the cases of tuberculosis are no longer concealed, but are brought to light; the patients are treated adequately and the contacts properly examined and cared for. Then, perhaps, more than anything else, is the importance of studying the financial condition of the patients or the vic-

tims of tuberculosis, and securing for them adequate aid from public and private philanthropies. And still another activity of the tuberculosis worker is that of promoting general health conditions, that is, teaching that tuberculosis is spread by conditions of bad employment, bad housing, overwork, and the presence of other diseases.

As an illustration of the type of work needed to be cared for by the nurse the following is extracted from the Standards for Tuberculosis Work in a Generalized Nursing Program issued by the East Harlem Nursing and Health Demonstration:

SPECIFIC METHODS

1. **Selection and Arrangement of Patient's Room.**—Select a separate room that is exposed to the sun—southern is preferable—and one with two or more windows, if possible.

See that the room is not a passageway, and that it gives easy access to the bath or toilet.

Furnishings to be simple, easily cleaned. Room arranged with view to cleanliness—bare floor or small rugs.

If the patient is not confined to bed he may help with care of his room. Mop floor with 5 per cent. solution of washing soda. If sweeping is necessary, dampen floor and use broom covered with washable cover, to be boiled frequently. Burn all sweepings. Dusting to be done with oiled cloth—to be boiled frequently.

(Note: Use in water a tablespoonful of washing soda. This combines with oil in cloth and makes a soapy solution.)

2. **Care of Room After Removal of a Tuberculous Patient.**—The room should be given a thorough cleaning; floors, woodwork and windows washed with good, hot soapy water. A fresh coat of paint, or white-wash, or fresh wall-paper if the walls are papered is desirable. The room should be well-aired and sunned (for several days,

preferably a week). Exposure of bedding, rugs, etc., to direct outdoor sunlight is an important part of thorough terminal disinfection. Articles should be turned so that both sides of each article are exposed for at least two or three hours to strong sunlight.

(Note: Wash and boil everything that can be possibly boiled—blankets, mattress covers, etc.)

3. **General Care of the Patient.**—(Patient's toilet articles should be kept in his room, and under no circumstances should they be used by any other member of the family.)

General care should always include care of the patient, bed-making, care of the sick room, and very definite instructions to a responsible member of the family. The amount of actual service rendered by the nurse herself will have to be judged by the individual situation, always bearing in mind that the patient must be adequately cared for. The nurse should teach the family to meet its individual needs as far as possible.

General care (full) includes care of mouth, nails, hair, bath, and the remaking of the bed.

Bath.—Before commencing the bath, see that the room is sufficiently warm and free from drafts. Remove bedspread and fold. If no fresh linen is available, be sure that the sheets are well protected. Use plenty of hot water and soap. Bath water should be emptied into toilet by nurse—never use the kitchen sink. Wash the face, neck, and ears. Then bathe anterior chest before the upper extermities. After turning patient, the back, lower extremities, and perineum are bathed. The water should be changed frequently, at the discretion of the nurse.

Pressure Spots.—The back and axillæ require careful inspection and attention. The family physician must be notified if pressure sores occur. Teach family how to avoid this by keeping the skin dry and clean, turning patient frequently, and by using pillows, pads, and rings under bony prominences.

Soiled Linen.—Place soiled linen in a covered wash-

boiler, containing a solution of washing soda (1 tablespoonful to 1 gallon of water).

Care of the Hair.—Before combing, see that the pillow is protected. Wash comb and brush frequently in 5 per cent. solution of washing soda.

Care of the Teeth and Mouth.—This is important, and, if possible, a tooth-brush should be used, with a tooth powder, paste, or ivory soap (if not objectionable to patient).

Care of the Tooth-brush.—Boil for five minutes at least once a week in 5 per cent. solution of washing soda. Rinse thoroughly in warm water and soap each day and dry in sun. If patient is too ill to use tooth-brush, use applicators covered with absorbent cotton and moistened with normal salt solution, bicarbonate of soda, boric acid, or any alkaline mouth-wash. Glycerin and lemon-juice may be used when indicated. (Dilute glycerin with equal parts of water. Four parts of diluted glycerin to one part of lemon-juice.)

4. **Dishes.**—The dishes used by the patient should be placed in pan of cold water containing soap powder or washing soda, and boiled at least five minutes before being washed. Keep dishes, including salt and pepper shakers, when not in use, on separate tray.

5. **Disposal of Sputum.**—Burning. This is the best method. For this purpose, a metal frame with pasteboard container is used. The pasteboard cup can be burned directly (wrapped in newspaper) and should be changed twice a day and oftener, if necessary. The metal frame can be boiled—daily—covering it with water, in a basin kept for this purpose, boiling five minutes.

Paper Napkins.—These should be used by the patient, instead of ordinary handkerchiefs. These should be placed in a bag, pinned to the side of the bed, to be burned at least once a day. Patient should be instructed to cover mouth and nose when talking, coughing, or sneezing.

6. **Clothing** from the patient's bed, if confined to bed,

should be treated as for other communicable diseases, *i. e.*, placed in a large covered boiler and boiled from ten to fifteen minutes before being sent to the laundry. (Use 1 tablespoonful washing soda to 1 gallon water.)

Articles that cannot be boiled may be placed in a disinfectant—1 per cent. solution C.N., or 2 per cent. solution lysol; or exposed to direct sunlight for not less than two hours.

Special apron should be kept in patient's room for caretaker.

7. **Care of Hands.**—Scrub hands thoroughly with brush and liquid soap before and after giving any care to a tuberculous patient.

8. **Care of Children.**—Children in the family should be kept from direct contact with the patient. Children should not be allowed to play in the patient's room. Babies should not be allowed to crawl on floor in room occupied by a tuberculous patient.

Mycotic Diseases of the Lungs

There are several chronic diseases of the lungs that resemble tuberculosis so closely that a differential diagnosis is somewhat difficult. They are, for the most part, due to infection with molds or fungi, and are found especially among those living in close contact with animal life. Thus, there is the actinomycocis, identical with "lumpy jaw" of cattle. Again there is blastomycosis, which is a form of yeast, and appears to be obtained from insanitary dwellings. There is also the coccoidal granuloma, found in the San Joaquin Valley of California. Then there is aspergillosis, seen most often in the form of the Aspergillus fumigatus, a branching mold or fungus found also as a disease of birds, cattle, and even dogs.

These diseases are usually slow in developing, but also difficult to eradicate. But because they are not easily disseminated they do not have the public health importance of tuberculosis.

CHAPTER IV

DIPHTHERIA

Prevalence.—In 1925 diphtheria caused 8058 deaths in the United States, *i. e.*, a mortality rate of 7.8 per 100,000. In 1900 the rate was 43.3 per 100,000. This shows a decrease which can be credited to preventive medicine, because this decrease is directly due to the introduction of the antitoxin treatment and the development of preventive inoculations.

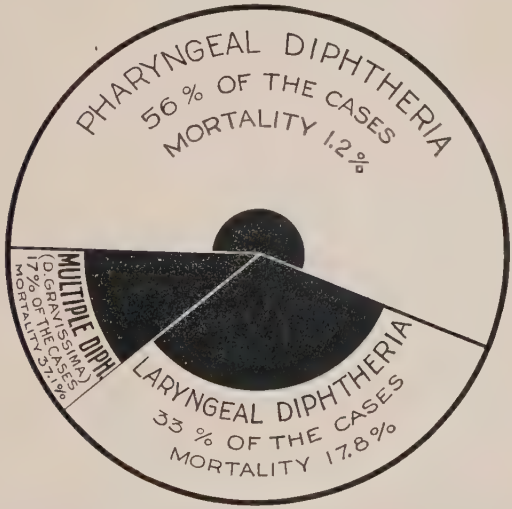

Fig. 18.—Diagram of the proportions of the different types of diphtheria.

The disease is more or less endemic in the United States, but is characterized by epidemic outbreaks in different parts of the country from year to year. Consequently, the returns from different cities vary from year to year But, on the whole, the cities have a greater mortality than

the rural districts, and the cities with the best development of public health departments have a lower mortality than cities running without such strict public health supervision.

History.—The disease is probably of oriental origin. We find references to it in medical writings dating from just before the Christian era. Thus, notations on this disease are found in the writings of Areteus of Cappodocia, a Greek physician, who lived in the first century A. D. It was called the Syriac ulcer, the Egyptian ulcer, the suffocating disease, malignant angina, croup, etc., until its true nature and definition were ascertained by the dicovery of the causative organism by Löffler in 1884. This, of course, is so recent that even now one finds among the public some confusion as to the nature of this type of throat trouble.

Age.—It is particularly a disease of childhood. Thus in the reports for 1923 of a total of 5875 cases occurring among the males and 5754 cases among the females, 3537 and 3081, respectively, occurred to children under five years of age. Nevertheless, cases are on record of patients dying from the disease at the age of seventy-five to eighty-nine years.

Bacteriology.—The bacillus of Löffler (Corynebacterium diphtheriæ) is a slender rod characterized by having knobbed ends. These bacilli are easily stained with methylene-blue, and thus a diagnosis of their presence can be quickly made.

Transmission.—The disease is transmitted chiefly by contact, but it is one of the diseases in which the "carrier" plays a great rôle because we find these bacilli in the throats and noses of a large percentage of apparently healthy people. We find them present also in people who have recovered from the disease. Consequently, when caring for this disease, we have to think of transmission by visitors and nurses and doctors—in other words, transmission by third parties. As in the other

respiratory diseases, droplet infection (spray from the mouth) is generally the cause of the transmission. But it is also transmitted by kissing and by the use of common drinking cups, etc.

Incubation.—The incubation period varies from two to ten days.

The virulence of the bacilli varies greatly. Consequently, we find some that seem to have no particular toxicity, while others are capable of starting an epidemic in almost any community.

This disease is characterized by the development of a toxin that has particular influence on the heart. But as a secondary result of this constitutional toxin there has developed in those people who survive the disease an immunity which is so great that it may be transmitted from the mother to the babe. The result is that in any group of people we find a goodly number who have a natural immunity to diphtheria.

Schick Test.—This immunity is ascertained by the use of a skin test wherein one injects into the skin with a needle some diluted toxin of diphtheria. If the individual tested is liable to take the disease (*i. e.*, is "susceptible"), there develops at the point of inoculation a swelling and reddening of the skin. This shows itself in from twelve to twenty-four hours and may remain for forty-eight hours. Those who are immune do not develop any more of a reaction than they would from the injection of simple salt solution.

Prophylaxis.—Preventive medicine is practised nowadays by using this test (the so-called Shick test) on all children; and by injecting into those children, which prove to be susceptible, some toxin of diphtheria combined with a sufficient amount of neutralizing antitoxin to develop in those individuals an immunity. This prophylactic treatment is called the toxin-antitoxin (familiarly "T-A") treatment. Many physicians look upon is as such a simple procedure that they inject into all their children without the preliminary Shick test.

Morbid Anatomy.—The disease is characterized by the development of a false membrane (which appears ordinarily on the mucous membrane of the pharynx at the level of the tonsils) of a grayish-white color and which cannot be removed easily from the underlying surface. This membrane may also appear in the nose or, again, as low in the trachea as the larynx. When in the latter situation it develops the typical hoarseness and difficulty in breathing which we know under the name of croup. This is due, of course, to the closure of the passage by the swelling

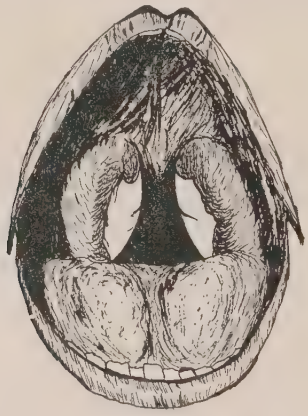

Fig. 19.—Membrane of diphtheria showing on the tonsils.

of the mucous membrane and also from the false membrane itself.

The bacilli may be carried by the blood-stream to other parts of the body and produce secondary foci.

Symptoms.—Frequently the disease begins with a gradual development of a sore throat and fever. But sometimes the throat may not show any great soreness. And again the disease may begin suddenly with an intense headache, vomiting, and chills. In any case the pulse is more rapid than one would expect in a case of ordinary tonsillitis. Occasionally the glands of the neck may be-

come swollen and tender and we have them "malignant angina."

Diagnosis.—The diagnosis is made by the examination of the throat. A sterile swab is rubbed over the suspicious area and the material thus brought away is examined at once under the microscope and also cultured for twelve hours. It occurs quite frequently that in the smear thus examined one finds only an occasional Klebs-Löffler bacillus, but in the culture great numbers.

Complications.—The complications are usually due to secondary infections, such as when streptococci invade the lungs, the ears, or the kidneys. Thus, some patients develop pneumonias which are extremely difficult to handle. Again, otitis media (middle-ear disease) may arise from an extension of the inflammation from the postnasal space back through the eustachian tube. Or, again, the kidneys may be inflamed by the germs as they pass from the blood-stream out into the urine. These complications may be prevented in large measure—first, by keeping the patient quiet; second, by keeping the nose and throat clean; and, third, by giving sufficient amounts of water or other fluid to keep the urine well diluted. The cleansing of the nostrils can be done with a 10 per cent. solution of silver albuminate introduced either with a medicine-dropper or spray, or it may be done with some simple alkaline solution, such as the alkaline antiseptic solution of the National Formulary.

Sequelæ.—A sequel of the disease, the serum rash, is now fairly frequent. This may appear from one to two weeks after the injection of the antitoxin and is characterized by reddened blotches on the skin and is usually attended with considerable itching. It is not at all dangerous, and the only attention it needs is to soothe the skin with oils, ointments, or simple alkaline baths.

But the really dangerous sequel is paralysis. The most common form of paralysis is that of the muscles of the pharynx so that the patient talks imperfectly and

swallows awkwardly. The eyes may be affected so that the patient may look cross-eyed or have a falling of the lid. Again, there may be a hemiplegia, that is, a paralysis of one side of the body. These paralyses have a tendency to recover as soon as the toxins are out of the system.

Treatment.—The treatment of the disease is by the use of antitoxin. This should be injected as soon as the diagnosis is made and in sufficient quantity to do its work. The injection may be made into a vein or underneath the skin. The number of the units is usually from 10,000 to 20,000.

At the same time the patient is made more comfortable by the use of gargles and sprays and the application of cold compresses about the neck.

Tracheotomy and Intubation.—If the disease is causing suffocation through the closure of the larynx, the surgeon has to open the trachea below the larynx and put in a tube, or else has to pass a tube down through the larynx to keep it open. The first is called tracheotomy, the second, intubation. In either case the nurse has to see to it that the tube is kept clean. This is accomplished ordinarily by using a suction syringe and drawing out the accumulation of mucus and fluids. Only in cases of emergency should she try to clear the tube by sucking it with her own mouth. In such cases, of course, she must see to it that she herself has the antitoxin at once.

Patients suffering from diphtheria must, of course, be isolated (separate rooms), and should not be freed until the throats and noses have been cultured and found free from the bacilli.

These patients feel much more comfortable if the air in the room is moist. It is still better if it is moistened with soothing balsams like the compound tincture of benzoin. To secure this condition one can employ the steam vaporizors now on the market or use an ordinary tea-kettle and dissolve about a teaspoonful of the com-

pound tincture of benzoin in each pint of water. This solution should be renewed every two to three hours. Where one cannot use the entire room or has not sufficient steam to moisten the entire room, steam chambers can be made by the erection of a croup tent. The simplest form of croup tent is that made by placing bars over the head- and foot-boards of the crib or bed and throwing sheets or blankets over those bars or rods and then having the steam enter by means of a rubber tube at the side of the bed or crib. The temperature of the room, of course, should be as cool as is consistent with the comfort of the patient, *i. e.*, 60° to 67° F. The air should be freshened by the direct access of out-door air.

Any person, whether child or adult, suffering from diphtheria must be kept quiet and in bed, because the chief cause of death is the paralysis of the heart from the toxins of the disease. In fact, it is important to keep the patients quiet and in bed even after the fever has gone. Patients should not be allowed to go to the bath-room or even raise themselves up in bed unless the doctor feels absolutely sure of the integrity of the heart.

Prophylactic Use of Antitoxin.—All persons exposed to the disease should receive prophylactic doses of antitoxin. The dose for this purpose is usually 1500 units. Such persons should be kept under observation for at least ten days, for the incubation period varies from two to ten days.

After the conclusion of the disease the room occupied by the patient must be thoroughly disinfected. All the furnishings that can be thus treated should be cleansed by hot water and soap. Fumigation to be effective must be more than usually thorough. New paint and paper should be applied to the walls wherever possible.

Immunity.—Immunity is that property of the tissues of the body produced by their reaction to some protein poison which enables them to digest or neutralize succeeding doses of that protein. The reaction occurs

usually in from three to seven days after the entrance of the poison into the body. If, therefore, one wishes to immunize a patient against a disease, he injects small but increasing doses of the toxin underneath the skin at intervals of five to seven days for four or five doses. This is technically called vaccination or prophylactic inoculation. As a result of it the tissues of the body come to resist that particular disease when given in amounts comparable to the doses used in the vaccines. Thus to prevent diphtheria one uses the toxin mixed with a neutralizing dose of antitoxin and thereby secures an immunity without the danger of developing dangerous symptoms.

But a temporary immunity may be developed by introducing into the human body the products (*i. e.*, "immune bodies") obtained from the blood of persons or animals which have survived an attack of the disease. Thus, diphtheria is treated with the serum of horses which have been subjected to increasing doses of diphtheric toxins until their resistance to diphtheria is very great. In the same way, one can take the serum of patients who have had scarlet fever and inject it into patients sick with scarlet fever and hasten their recovery from the disease. This type of immunity is not as lasting as that produced by the use of vaccines, but develops, naturally, much more quickly. Usually its effect is to be noted in from twelve to twenty four hours. It is the "serum treatment," as contrasted with the vaccine treatment just described.

Technic of the Toxin-antitoxin Treatment. William H. Park, M. D., New York, in the Journal of the American Medical Association, vol. 79, November 4, 1922, p. 1589:

Three injections, 1 c.c. each, of a suitable toxin-antitoxin mixture spaced one or two weeks apart, will cause about 85 per cent. of susceptible children or older persons to develop sufficient antitoxin to give the negative Schick reaction and produce marked, if not absolute, protection against diphtheria.

The development of the immunity is slow. An amount of antitoxin sufficient to prevent the positive Schick reaction develops in the different children in from one to six months after receiving the injections. Antitoxin as heretofore must continue to be used to produce immediate immunity.

The duration of the immunity in at least 90 per cent. of the children is for more than six years and probably for the remainder of life. There seems to be no difference in this respect between these and those who develop antitoxin naturally. No child should be pronounced immune from diphtheria because of having received three immunizing injections of toxin antitoxin. A negative Schick test is absolutely necessary before one can properly make such a statement or issue a certificate.

The toxin-antitoxin injections are inadvisable before the age of six months. During this time most of the infants retain the antitoxin received from their mothers. Up to the age of three months immunizing injections are usually ineffective, as the infant tissues do not respond sufficiently during this period to the toxin-antitoxin to produce antitoxin. Under usual conditions it is probably safe to wait until the infant is nine months old and then to give the injections at the first suitable occasion. During the first three years there is almost no annoyance from the injections. As the child grows older the danger from diphtheria gradually lessens, and the percentage of those developing annoying local and constitutional reactions slowly increases.

CHAPTER V

FOLLICULAR TONSILLITIS—VINCENT'S ANGINA—LUDWIG'S ANGINA—MUMPS—GLANDULAR FEVER—FOOT AND MOUTH DISEASE—MILK SICKNESS

Follicular Tonsillitis

The tonsils consist of masses of lymphoid tissue. Their function seems to be to moisten the inspired air and possibly to take up the dust and microbes that would otherwise be carried to the lungs. They serve their chief uses in childhood and gradually atrophy in adult life.

Tonsillitis is usually caused by the infection by some form of streptococcus. It has to be distinguished from Vincent's angina, where the infecting agent is of spirochetal origin, and from diphtheria caused by the Klebs-Löffler bacillus. It rarely causes death except through its sequelæ, but it is notable from the fact that repeated inflammations lead to rheumatism and other diseases of the body as a whole.

Follicular or lacunar tonsillitis usually begins with a day or two of malaise, and then fever, sometimes a chill, and a general aching throughout the body. This onset is hard to distinguish from that of such infectious diseases as smallpox or influenza, or any other epidemic disorder. It lasts long enough for the body to gain immunity to these organisms, that is, from three to seven days. The tonsils are studded with white spots, or even with a complete membrane of whitish or grayish-white color.

Because of the serious sequelæ it is wise to treat tonsillitis more respectfully than is sometimes done. It is unwise for teachers to continue in the classrooms or for nurses to continue on duty while they have tonsillitis.

Treatment.—The treatment calls for rest in an even temperature, the application of cold to the neck, the use of ice or cold drinks, and the administration of the salicylates, such as aspirin. The bowels should be opened with a brisk cathartic, such as calomel. If there is much general distress, opium, in the form of Dover's powder, serves a good purpose. Gargles and swabs do little good except to relieve the dryness and unpleasant sensations in the mouth.

If the process causes the formation of abscesses in the depths of the tonsils or in the peritonsillar tissues, then it is usually necessary to incise these and drain them; and retropharyngeal abscesses are particularly to be watched out for, because they may lead to fatal results if not opened in time. Tuberculosis of the tonsils should be suspected if there are repeated inflammations.

Prophylaxis.—The prophylaxis of tonsillitis requires, of course, the removal of the tonsils as soon as they have become so diseased as to be of little use to the body. On the other hand, since the tonsils have a function to perform in early childhood, they should not be removed without evidence of real disease. Hypertrophic tonsils in adult life are usually evidence of themselves of the presence of inflammation within them.

Vincent's Angina

Another inflammation of the mouth and throat should be mentioned in this connection. This is Vincent's angina, an inflammation of the tonsils and fauces, which is characterized by a membranous exudate closely resembling that of diphtheria. The fever is less than that of diphtheria, as are also the constitutional sysmptoms, such as prostration and cardiac weakness. The neighboring lymph-glands swell. The attack may be so severe as to lead to an ulceration of the uvula and the soft palate.

The disease is caused by a spirillum of the life-history of which very little is known.

The treatment is best carried on by swabbing the affected areas with the tincture of iodin, strong solutions of sodium bicarbonate, or of arsphenamin.

Prophylaxis.—Great cleanliness and the disinfection of the sputum, as well as the articles coming into contact with the patient are necessary, for the disease is communicable. It is sometimes called "trench mouth."

Ludwig's Angina

Following septic fevers—such as diphtheria, scarlet fever, and typhoid—there may arise a gangrenous inflammation of the floor of the mouth, beginning in the submaxillary gland. It is probably a "streptococcic" infection. It spreads backward to the fauces, and may set up edema of the glottis. The soft parts may slough—"cynanche gangrenosa"—or an abscess may be formed. Swallowing is painful. The fever rises and falls irregularly, as in other septic conditions.

The treatment consists in an energetic cleansing of any exposed foci of infection, the application of heat or sometimes of ice-packs to the neck, and the administration of antiseptics. The spread of the infection to other parts of the body must be guarded against, and the incision of the abscesses may have to be resorted to.

Mumps

The salivary glands, which supply the digestive fluid for the mouth, consist of the two parotids lying deep in the cheek just in front of the ear, the two submaxillaries lying under the lower jaw, at about the angle, and the sublingual, which almost fills up the space between the submaxillaries. These glands can be infected by way of their ducts, which empty into the mouth or by the way of their blood-supply. Fortunately such infection is rare. The duct of the parotid glands empties on either side just opposite the upper second molar tooth, and is, therefore, more exposed to infection than the other to ducts which are protected by the tongue.

Mumps is an epidemic inflammation of the parotid glands. Its technical name is, therefore, epidemic parotitis. It is one of the so-called diseases of childhood, but attacks adolescents and adults as well. Under one year of age there is less susceptibility than between that age and puberty. It has no mortality. Its most serious complication is the secondary inflammation of the testes (orchitis) or ovaries (oöphoritis) in those who have reached puberty.

The disease is very painful, because many nerves and blood-vessels pass through the substance of the gland and are pressed upon by the swelling. This prevents the wide opening of the mouth. The swallowing of acid foods is painful, because the acids stimulate the glands to activity. One side is usually attacked before the other. There is no formation of pus or abscess formation unless from some complicating infection.

It usually takes the disease two or three weeks to appear after the patient has been exposed, but it may appear within forty-eight hours.

It begins with the swelling of the cheek and pain in the movement of the jaw. The fever is continuous and rarely goes above 101° F. The fever continues, including the gradual subsidence, for a week or ten days, after which the patient feels as well as ever.

The chief complication is for patients who have reached the age of puberty, for in them the genital organs are frequently attacked by what might be called an extension of the disease—a very painful swelling with a moderate fever. The only way to prevent this is to keep the patient quiet and in bed from the very onset of the disease. However, other very serious disorders have arisen in the course of mumps, such as cerebral disorders, delirium, coma, pneumonia, endocarditis, etc. These show that the treatment of the disease is not to be neglected.

The disease is so contagious that patients should be isolated, for it is not at all safe needlessly to expose small children. While the disease itself does little harm, its complications may jeopardize life.

Treatment.—The treatment consists in keeping the patient quiet, and in keeping the swollen glands warm and soft. Patients should not be allowed to play out of doors unless the weather is perfect. In general, the keeping of the patient in one room of even temperature is safer. Application of kaolin poultices (known also as clay poultices, kataplasma kaolini), applied thick and warm, usually keeps the patient free from pain. The mouth should be cleansed frequently with hydrogen peroxid.

Because of the difficulty in swallowing the food should be fluid or semisolid, and should not be of such character as to demand mastication. Broths, soups, bread and milk, junkets, custards, eggnogs, etc., can all be used if given judiciously.

Glandular Fever

Another swelling of the glands due to an infection from the outside is known as the glandular fever, and also as an infectious mononucleosis.

Osler defines it as an infectious disease, usually in children, developing, as a rule, without premonitory signs and characterized by slight redness of the throat, high fever, swelling and tenderness of the lymph-glands of the neck, particularly those behind the sternocleidomastoid muscle.

The disease is seen both sporadically and in epidemics. Other glands than those of the neck may be involved. It would probably be impossible to differentiate this disease from the swelling of the glands accompanying tonsillitis and other throat troubles if it were not for the fact that the blood picture shows an increase in the mononuclear cells and the total increase is great. That is, 75 to 80 per cent. of the white cells may be the mononuclears, and the total count 15,000 to 20,000.

The fever is slight, but runs up as high sometimes as 103° F. The intestinal tract is upset and there is pain in the muscles.

Usually there are no bad results, but occasionally, under poor care, an abscess in one of the glands may develop.

The swelling of the glands may persist from ten days to several weeks.

The treatment, of course, requires rest and soothing applications to the neck. This is one of the places where the clay poultice shines.

Of course, there may be complications in the way of the infection of the kidney, even hemorrhagic nephritis; infection of the middle ear (acute otitis media), and abscesses in the back of the throat. For these reasons the care of the patient should not be neglected, and the physician should be called to make a careful examination.

Foot-and-Mouth Disease

This disease is also called "epidemic stomatitis" and "aphthous fever."

It is primarily a disease of domestic animals, such as cattle, sheep, and pigs.

The disease reaches man by means of drinking infected milk, and milk products, and also by contact with the animals sick with the disease.

It begins with general malaise, fever, and discomfort in the mouth. The eruptions in the mouth and throat and on the lips point out the diagnosis. They are in the form of vesicles and usually ulcerate.

The disease ordinarily lasts from ten days to three weeks.

The prognosis is usually good, but a mortality of 8 per cent. has occurred (according to Osler) in one epidemic.

The disease is prevented by boiling all suspicious milk and taking care of one's self adequately when having to do with sick animals.

The treatment consists of the general means of quieting the patient, making him comfortable, and also washing out the mouth with antiseptics, such as potassium permanganate.

Milk Sickness

This disease has come into prominence recently because it has been discovered that it is connected with the "trembles" of cattle. It, therefore, comes from using the products of diseased cattle.

The symptoms are those of an acute intoxication, beginning with uneasiness and distress. The patient vomits, has fever, and intense thirst. The bowels are constipated. The tongue, of course, is swollen. The breath is foul.

Patients may die of the disease, and in that case within two or three days; or they may last as long as three or four weeks.

This is another instance showing the necessity of careful supervision of cattle in the stockyards; and that no milk, or milk products, or meat from diseased cattle should be put on the market.

CHAPTER VI

SCARLET FEVER

Scarlet fever may be defined as an acute contagious disease characterized by high fever, a general scarlet rash, rapid pulse, and a sore throat. One other characteristic is that it is very apt to leave some infection of the kidneys following it.

Etiology.—The cause of the disease is the *Streptococcus scarlatinæ*, an organism to be distinguished from ordinary streptococci only by careful cultural tests.

The identification of this organism has made it possible now to manufacture vaccines and serums for the prevention and treatment of the disease. The test for susceptibility to scarlet fever (called the Dick test) is made by injecting into the skin of the forearm some diluted virus (toxin from the Streptococcus scarlatinæ). If there appears a sharply demarcated reddening of the skin about the point of injection, we call the patient susceptible. The reddened area should be as large as a cent or a nickel. Such persons as have been proved susceptible should receive the vaccines for immunization.

Age.—Most of the fatal cases are in children under ten years of age. This would suggest that parents have their children tested for susceptibility before they are sent to kindergarten or school.

Prevalence.—Four decades ago the death-rate was as high as 40 per 100,000, Now it has fallen to 3 or 4 per 100,000.

The cause of this decline must be looked for in the school hygiene which began to be general about 1905—perhaps also in the better control of the milk-supply. The decline stopped in 1918. In fact, there was a slight

rise until 1923. Since then the introduction of the prophylactic vaccinations has sent the curve downward again. We hope that the introduction of prophylactic vaccination will cause the disease to disappear.

Transmission.—The transmission occurs chiefly by direct contact. But objects, such as clothing, bed clothing, etc., may also apparently carry the virus of the disease. Frequently it has been found to be transmitted by milk and such articles of food.

Immunity.—One attack usually produces immunity for life.

Incubation Period.—The incubation period varies from one to seven days. The disease is infectious for something like forty days. It should be noted that a patient is infectious as long as the mucous membranes of the throat and nose remain unhealed.

Mortality.—The case death-rate varies from 3 to 30 per cent.

Complications.—The complications to be feared are the infection of the ears (otitis media), of the kidneys (nephritis), or even of the central nervous system, which may appear in the form of paralysis or meningitis.

Symptoms.—The initial symptom is usually vomiting accompanied by a sore throat and followed by a high fever (105° to 106° F.). The most prominent symptom is, of course, the rash, which appears anywhere from the second to the sixth day as thickly strewn fine points, first appearing on the chest. It disappears after four days. But the earliest signs of the disease are usually to be found in the throat. This is red and inflamed, strongly suggestive of tonsillitis.

As a contrast to the rash of scarlet fever, the rash of measles is coarse and appears first on the face. So, also, does that of smallpox. Chickenpox has so scattered an eruption that it could hardly be confused with scarlatina. When one presses with the finger a portion of the body covered with the rash of scarlet fever the part underneath

the finger becomes white, but grows red again as soon as the pressure is removed.

The tongue is coated white, but soon the reddened papillæ project through the coating, giving the tip at least the appearance of a strawberry. Hence the term "strawberry tongue," as applied to scarlet fever.

The temperature remains above normal for only about a week; but the disease is usually not over for nearly forty days; that is, the patient is capable of giving others the disease all this time.

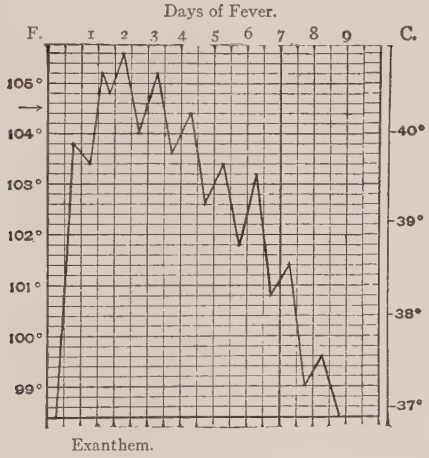

Fig. 20.—Temperature curve in scarlet fever (Sahli).

Another characteristic of the disease is the shedding of the skin, or desquamation. Desquamation begins at any time after the fourth day, and is complete except for the palms and soles by the end of the fourth week. In scarlet fever the skin peels off in rather coarse particles—from the hands and feet often in great strips—as contrasted with the desquamation in measles where the particles are fine and branny.

Treatment.—When available, a specific serum may be used to cut short the disease. Sometimes it may be wiser to let the patient go through with an attack of the disease in order to secure greater immunity. This matter, of course, should be left for the attending physician to decide.

In any case, the health authorities should be notified and the patient properly isolated. It is not necessary to put the patient in a separate house, provided a separate suite of rooms can be provided for him and his nurse. Thus, to put the patient upstairs while the rest of the family lives downstairs is usually sufficient. This isolation should be continued until desquamation ceases. The family should not care for the patient indiscriminately, but there should be one regular attendant who carefully disinfects both herself and her clothing before mingling with the family.

The room should be, of course, well ventilated and heated. The hangings and bric-a-brac should be removed; but ample provision should be made for shading the room when the patient's eyes seem weak. In this matter it should be remembered that the room and its hangings must all be disinfected after the illness, and that easily destroyed material has no place in it. The temperature should be maintained at 68° to 70° F.; in no case should variation of more than 5° F. be allowed.

During the high fever the patient's diet should be restricted to fluids, such as milk, cream soups, teas, cocoa, etc. Water should be freely given. In order to make it more palatable it can be given carbonated or in the form of lemonade. During convalescence the patient should have a mixed diet of more vegetables than meats. Zwieback, or oven-dried toast, soft-boiled or baked eggs, egg-nog, oysters (if fresh), fruits (especially cooked fruits), in addition to easily digested meats, will offer a good selection. In this disease the kidneys are particularly liable to affection; hence the need during the days of

convalescence of eating such things as do not irritate the kidneys in their elimination. The most important of these irritants to be avoided are spices, alcohol (wines, whisky, brandies, etc.), rich meats, beef-stock soups, bouillon, etc.

The temperature when excessive is best controlled by cool sponge-baths (65° F.); but as soon as the fever will permit the skin should be rubbed with a neutral oil, such as olive, cotton-seed, or castor oil. This will not only diminish the itching, but will also keep the infectious particles of cast-off skin from flying about loose in the air.

In order to disinfect her hands the nurse should keep a bowl of 1 : 1000 solution of corrosive sublimate or a 5 per cent. solution of the compound cresols standing at the door. It would be well, also, if there was provided for the doctor a long coat or gown which he could slip on when he comes into the room. This, of course, should be kept hanging within the isolation boundaries, but outside the door of the sick room.

The nurse should be particularly careful to see that the patient does not chill. This would cause some of the sequelæ mentioned above. The cause of such chilling is usually too great variation in the temperature of the room. For example, the patient may become overheated and the reaction would then cause a chill.

The sore throat of the patient, which may be so great as to show a membrane-like covering of the tonsils and posterior wall of the throat, may be relieved by the inhalation of steam charged with the compound tincture of benzoin. This soothes the membranes when the vapor is inhaled. The nostrils should be sprayed from a nebulizer or atomizer with mentholated oil if they are dry or if the throat shows signs of ulceration. The sore throat may lead to middle-ear infection (otitis media).

The earache may be relieved by dropping warm water into the ear and then plugging it (after drying) with cotton. Applying external heat by means of the hot-water

bag of thermophore to the head also helps the earache.

Inflammation of the lining membrane and valves of the heart (endocarditis) is a dreaded complication of scarlet fever. This usually means a valvular lesion for the rest of the patient's days. Its discovery should be followed by careful restrictions in exercise and diet.

Nephritis usually does not appear until later. Its appearance demands a milk diet, careful protection from changes in temperature, and freedom from school duties for several months. During the attack of acute nephritis the patient must be kept in bed whether he has fever or not. This complication is usually detected by smoky, bloody, and scanty urine. Routine examinations of the urine should become a habit in scarlet fever, so that such a complication may be detected at the earliest possible moment.

Sleeplessness, delirium, and headache are best combatted by the application of cold, cold baths, the ice-bag, or alcohol rubs.

The patient should wear in this disease—as in most others—only one thickness of clothing while in bed; in this case a light nightgown or suit of pajamas. Allowing patients to retain their ordinary underclothes is simply to invite the chilling mentioned above.

All clothing worn by the patient must be sterilized, for it may cause scarlet fever in some other wearer even a year or two afterward. Therefore, as long as the patient is kept in the house, washable garments should be worn, or, if not washable, those that can be burned. The attendant should also remember that the trays and dishes on which food is sent up to the patient may be dangerous to some child or susceptible person in the house unless they are cleaned and disinfected before being sent back.

The safest drink for scarlet fever patients (aside from pure water) is milk. Beer should be prohibited, as should any tonic containing alcohol.

Vaccination.—There are two types of prophylactic vac-

cination available. The older and more common one requires three hypodermic injections at intervals of seven to ten days. The other (ricinolated vaccine) uses a heavier dose and is given in one injection.

Immunity does not appear immediately. Therefore, when a child has been exposed to scarlet fever a prophylactic serum should be used, rather than a vaccine. It should be remembered that serum sickness is a frequent result of such serum treatments. This is not dangerous, but is very uncomfortable.

CHAPTER VII

MEASLES—GERMAN MEASLES—"FOURTH DISEASE"

Measles (Morbilli, Rubeola)

Osler defines measles as an acute, highly infectious disease, with specific localization in the upper air passages and the skin.

The disease has been known since the ninth century, but was confused with smallpox until the seventeenth century. Since it is a century-old disease, and since most adults have had it, measles is regarded as a children's disease. But the experience of the recruits in the Great War proved that adults are just as susceptible as children. The disease is one of the "exanthemata," of which scarlet fever and chickenpox are other examples. The exanthema or skin eruption is not the essence of the disease, but only an outward manifestation of a generalized inflammation.

Prevalence.—Epidemics of measles occur every three to seven years in the United States. They seem to be accompanied by whooping-cough. Since the causative organism has not yet been surely isolated, we can only check the disease by careful segregation and isolation of the sick. But even so it would seem as if every one must have the disease during his life.

In 1925 the death-rate in the United States was 2.3 per 100,000. The mortality is greatest in two-year-old children. The case rate of mortality varies from 2 to 10 per cent.

Deaths are probably due to a secondary infection. For example, it is estimated that 95 per cent. of the deaths are due to the pneumococcus. Consequently, in measles

one must guard against complications due to infection of the lungs.

Furthermore, measles seems to have the unpleasant characteristic of rendering those convalescent from the disease more susceptible to other diseases. And par-

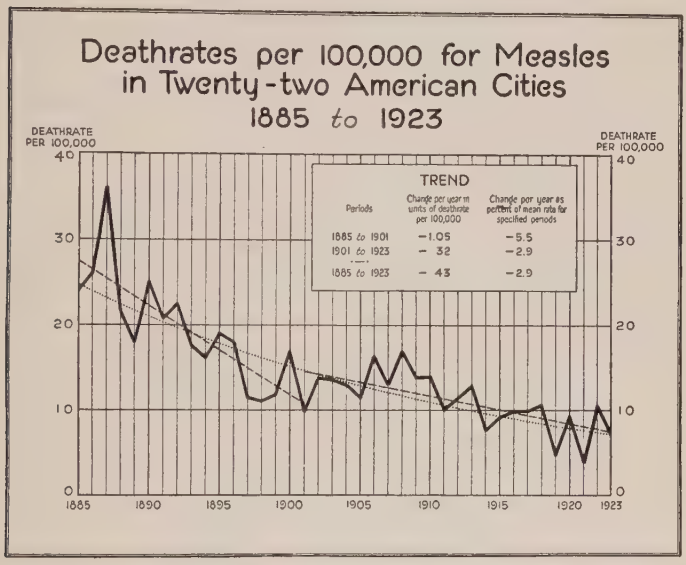

Fig. 21.—This chart, reproduced from the *Statistical Bulletin* of the Metropolitan Life Insurance Company, shows the results of the introduction of personal and community hygiene into the life of American cities. The discovery of the causative organism and the introduction of prophylactic vaccination should reduce the morbidity and mortality still more. But the mortality rate in 1926 was 8 per 100,000, the highest since 1920.

ticularly is this true of tuberculosis. Consequently, one should take special precautions to prevent tuberculosis in patients who have recently had measles.

The disease is communicated so easily and cross-infection is so liable to occur that if possible one should not handle measles patients in the hospital with others.

The transmission is by contact, probably chiefly by droplet infection, through the nose and mouth. Patients seem not be infectious after the fever leaves.

Symptoms.—The disease begins with a general feeling of being unwell, then the patient begins to sneeze and feel chilly; his eyes water and his nose "runs" (the general symptoms of a cold in the head). Then the patient begins to cough. This lasts for only thirty-six hours or thereabouts. The temperature begins about this time to rise slowly and gradually, and, after reaching 103° to 104° F., remains there for about four days, when the temperature usually falls again to normal. After the fever is well developed, a rash appears in well-defined separate spots, first on the face and forehead and only afterward on the trunk and limbs. These two characteristics differentiate this rash from that of scarlet fever. The rash of the latter appears first on the trunk and the spots are extremely small.

We cannot do better than quote Sydenham's description (1666): "The symptoms increase until the fourth day. At that period (although sometimes a day later) little red spots, just like flea-bites, begin to come out on the forehead and the rest of the face. These increase both in size and number, group themselves in clusters, and mark the face with rather large red spots of different figures. These red spots are formed by small red papules, thick set, and just raised above the level of the skin. The fact that they really protrude can scarcely be determined by the eye. It can, however, be ascertained by feeling the surface with the fingers. From the face—where they first appear—these spots spread downward to the breast and belly; afterward to the thighs and legs."

Desquamation begins after the eruption disappears. It is fine and branny, in contrast with that of scarlet fever, which is coarse and sometimes in shreds and scales.

There is always a leukopenia present, that is, a decrease in the number of white blood-cells. This is another

evidence of a lowered resistance of which the frequency with which tuberculosis, pneumonia, and other diseases occur after the disease, is one proof.

Incubation Period.—The incubation period varies from nine to eleven days. The rash appears on the thirteenth or the fourteenth day after the onset of the disease, that is, not after the appearance of the first symptoms, but after the receipt of the infection.

Early diagnosis can sometimes be made by finding Koplik spots on the buccal mucosa. They are about the size of pinheads, are white, and lie along the level of the teeth. These spots occur usually two days before the skin rash appears.

Treatment.—The patient should be isolated and put in a large and well-ventilated room, and the bed so placed that the light does not fall on his face and eyes. In fact, if the room be darkened with red curtains the patient feels very much better. This room should be kept at an even temperature—between 68° and 70° F. The quarantine should be maintained for three weeks.

The patient should be sponged off with tepid water and soap at least once a day. If this is followed by a gentle rub with a vegetable oil, the patient's skin will be in better condition and the particles of skin will not fly so readily about in the air of the room. In carrying out these directions the nurse should remember how infectious measles is, and should, therefore, disinfect herself before going into other parts of the house.

The diet should be light, but nourishing. Similar dietaries to those mentioned for scarlet fever should be used.

Complications.—There is a considerable liability of the patient's suffering from bronchitis as a development of the measles. Even bronchopneumonia with fatal termination develops frequently. Therefore, it is well to pay great attention to the above injunctions as to care, and also to keep the air of the room somewhat moist. The time of greatest danger is during convalescence, just when

an "ambitious" patient wants to be up and about. Needless to say, during all this time the patient must be kept out of the line of drafts and away from all exposure either to heat or cold.

The patient's eyes are so weak that he should not be allowed to use them for reading or similar work for some time after convalescence has set in—certainly not during the progress of the disease.

Measles may lead to an inflammation of the middle ear (otitis media). Hence, the need of careful cleansing of the nose and throat during all the first week of the disease. Irrigation and spraying of the nasopharynx should not be carried out with too great violence, otherwise the very act may drive the infectious masses back and up into the eustachian tube.

Gangrene of the cheek (noma, or cancrum oris) may also result if the mouth is not kept thoroughly clean. This is at the best disfiguring, but usually fatal.

When the eruptions fill with blood instead of clear serum, we have what is called "black measles." This is, of course, a much more serious form of the disease.

German Measles

German measles has been said to be a disease with the rash of measles and the throat of scarlet fever. It is, however, an entirely separate disease.

Incubation Period.—The incubation period varies from ten to sixteen days.

Symptoms.—The rash appears earlier than in measles, that is, on the first or the second day, beginning on the face and in twenty-four hours covers the whole body. It consists of papules arranged in patches rather than in the crescentic form that measles itself exhibits. The rash remains two or three days.

Onset.—The onset is general and the symptoms are mild—that is, one finds headache, sore throat, red eyes,

enlarged cervical glands, etc. The patient should be quarantined for two or three weeks.

Treatment.—The treatment is bed-rest and light diet with the care of the skin.

The desquamation is not as profuse or as regular as in eithes measles or in scarlet fever.

The prognosis is good.

Fourth Disease

Occasionally we see cases which show such hybrid characteristics that they cannot be classed with either measles or scarlet fever. Most writers classify them with German measles, but others separate them out into a "fourth disease."

Such cases, however, are so variable that to make of them a separate disease seems unjustified. Their characteristics are such that to all intents and purposes they may be treated as German measles.

Erythema Infectiosum

Another example of this group of diseases is the so-called erythema infectiosum. As the name indicates it is a reddening of the skin. On this reddened skin there may appear eruptions of various types and in various locations. It is not serious, and except for upsetting the patient for a few days has no public health significance.

CHAPTER VIII

TYPHOID FEVER—TYPHUS FEVER

Typhoid Fever

"In the Spanish-American War one American soldier of every five had typhoid fever within three months after enlistment; during the nearly two years of service in the World War one out of every 2700 had this disease. With the same admission rate for typhoid fever in 1917 to 1918 as in 1861 to 1862 there would have been 226,001 cases and 62,694 deaths, and with the same rate as in 1898 to 1899 there would have been 291,637 cases and 30,916 deaths; as it was, there were, all told, in the American Army during the World War, both in this country and in Europe, 1083 cases, with 158 deaths, from typhoid fever. During the five-year period from 1906 to 1910 the annual death-rate from typhoid fever for every 100,000 inhabitants in our cities of more than 500,000 population was 25.6; during the five-year period from 1916 to 1920 it was 5.8." (Hygeia, April, 1923, vol. i, No. 1.)

Prevalence.—The mortality rate in 1926 in fifty-nine cities where records have been consistently kept was 2.77 per 100,000.

In ancient writings typhus, typhoid, plague, and perhaps malaria and relapsing fevers were all grouped together. It was not until 1829 that Louis, of Paris, gave the name *typhoid* to the disease now recognized under that term. The distinction from typhus was brought to the United States by Louis' students—particularly Gerhardt, of Philadelphia, and Jackson, of Boston, who studied the American cases and published their reports on them, so that by the end of 1830 the conception of typhoid was quite clearly defined in the United States.

In a study of 638 epidemics occurring between 1870 and 1889 Schaudinn found that these had been transmitted by water in 71 per cent. of the cases. The result of the realization of this fact caused many municipalities to put in better water-supplies, with a resulting decrease in the typhoid mortality. Thus in Paris in 1882 the mortality from typhoid was 142. And in 1902, after the

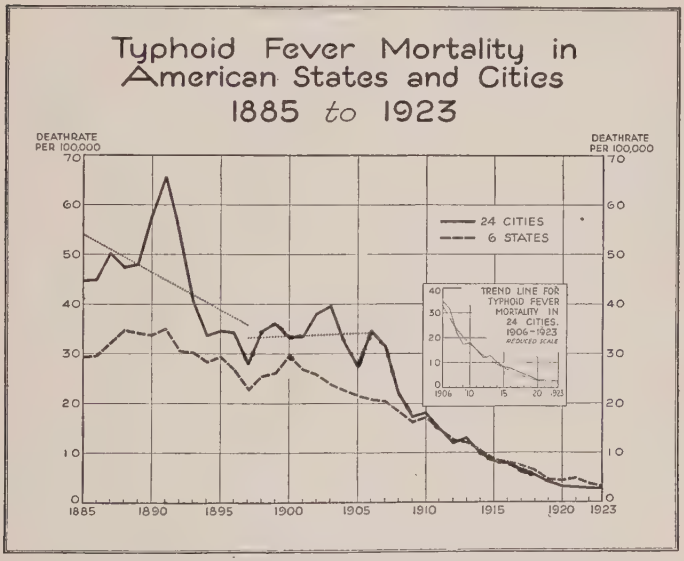

Fig. 22.—Higher death-rates prevail in the Southern States than in the northern. In 1923 the highest rate was in Tennessee. (From the Statistical Bulletin of the Metropolitan Insurance Co.)

introduction of a new water-supply, the rate was 17 per 100,000 population.

Dublin, of the Metropolitan Life Insurance Company, has shown that a curious periodicity has existed in the occurrence of typhoid fever in the cities of the United States for the last sixty years, that is, there seems a rise in the number of deaths every eighth year. But the curve, as a

whole, is declining, as may be seen on the accompanying graph.

Transmission.—The transmission of the disease is direct (through contact) and indirect (through water, food, milk, shell-fish, and vegetables). Direct contact occurs with those who are taking care of the patient; the indirect transmission is brought about not only through the use of infected food-stuffs but also by flies. This latter form of transmission has been particularly noticeable among the armies of the world.

Etiology.—This disease is caused by a bacillus which moves about by means of flagella arranged along its sides. During the sickness the bacteria causing it are to be found in the blood, hence it is really a bacteremia or septicemia. In the body the point most frequently attacked is the small intestine; in particular the last 20 inches of the ileum. The particular tissue attacked is the lymphoid tissue of the agminated follicles (or Peyer's patches). ("Lymphoid" tissue is the type found in the tonsils, adenoids, and lymphatic glands.) Under the influence of the bacillus these follicles swell up into great red tumors which look like swollen tonsils, though on a smaller scale, and the tops of the tumors finally slough off, leaving deep bleeding ulcers with undermined edges. In the normal course of the disease in a few days these ulcers are covered by "scabs," or scar tissue, which, after a time, is replaced by solid membrane and the bowel returns to its normal condition.

The prostration and utter weakness of the patient, characteristic of this disease, are caused by the absorption into the patient's blood of excretions (called toxins) from the bodies of the bacilli. These poisons affect the nerve-centers of the brain and spinal cord and, therefore, reduce to its lowest point the patient's vitality.

The dangers of the disease are, therefore: First, hemorrhage from the ulcers in the intestine. Since, in the sloughing process one or several small arteries may be

broken into, the patient may lose so much blood as to reduce him below the rallying point. Second, the thin wall of the intestine at the bottom of the ulcer may be broken through either by increased movement of the intestines—*i. e.*, as after the use of physic, or by hard substances, such as hardened feces in the intestines, or by an exaggeration of the sloughing process. This perforation allows the contents of the intestine to escape and to enter the peritoneal cavity, thus producing a fatal peritonitis. Third, the failure of the body to produce antibodies or antitoxins, so that the bacteria flood the system and bring about the septicemic type of death. Fourth, the localization of the bacteria in the brain or other vital center, thus producing meningitis or other fatal complication.

Normally typhoid fever is a self-limited disease because the normal body is able to form antitoxins in two or three weeks, which gradually neutralize the toxins exuded by the bacilli. These antitoxins infiltrate the whole body, and make the tissues of the body uninhabitable for the bacilli. Therefore, if the ordinary patient can be supported and protected from accidents, he has a good chance of surviving the disease.

The duration of the disease is usually four weeks, but it may be shorter or longer.

The period which elapses between the first receipt of the infection into the body and its breaking out (*i. e.*, the incubation period) varies from eight to twenty-three days, averaging fourteen days.

The mortality of the disease is usually estimated at 10 per cent.; but, in the mortality statistics of most states it will be found to be much higher, probably because physicians are careless about reporting any but the most severe cases. But the fact that 1 in every 10 attacked dies indicates the necessity of paying close attention to its treatment and dissemination.

Symptoms.—The disease begins with very indefinite

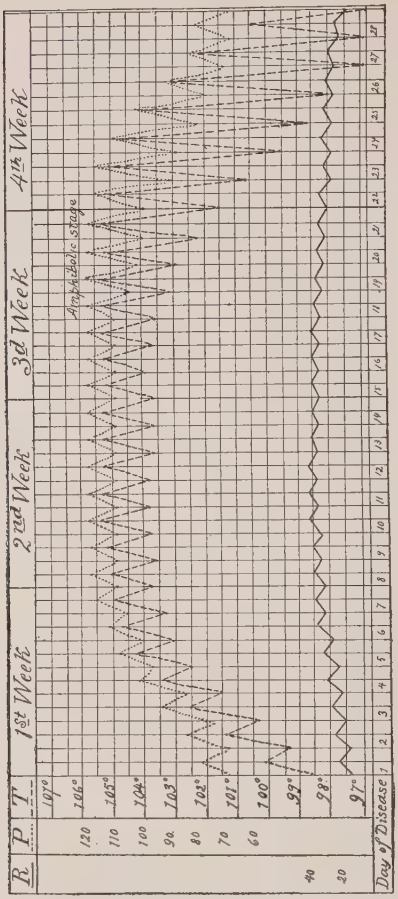

Fig. 23.—Temperature, pulse, and respiration curve in typhoid fever (schematic) (Sahli).

symptoms—general malaise, headache, lack of appetite—which increases from day to day until there is vomiting, a slight fever, a pronounced intestinal disturbance, such as constipation or diarrhea, and a general weakness. The

fever rises gradually from day to day for about a week, being higher each evening than in the morning, and reaching, at its maximum, 104° to 106° F. It remains for about a week at its maximum, with only the daily variations, then shows a gradual decline, each morning being lower than the preceding evening, so that one has in this descent the picture of a stairway when one plots it out on a chart (Fig. 23).

The pulse ranges lower than the temperature would indicate, rarely going above 120 and usually below 100. This is one of the chief characteristics of the disease; and when one finds a temperature of 103° and 104° F., with a pulse of only 80 or 90, one has reason to suspect typhoid fever. Another characteristic is a double impulse of the pulse beat. Instead of feeling a single pulse, as in the healthy person, we feel a strong, followed by a weaker stroke (dicrotism).

The disturbed condition of the bowel is shown by an irregular alternation of diarrhea and constipation. The stool becomes watery, and has a pea-soup appearance. The odor also becomes unnatural, having a peculiar fetid character. These symptoms are affected by the diet and treatment, and, therefore, vary greatly.

On about the sixth or seventh day there may appear eruptions on the trunk, especially over the abdomen. Their color has caused them to be called "rose spots." They vary from $\frac{1}{8}$ to 1/16 inch in diameter and their color disappears on pressure, *i. e.*, if one apply a piece of glass to the suspected spot one notices that the spot appears blanched through the glass.

Still another symptom is the twitching of the tendons (subsultus tendinum), especially in the wrists. This is irregular and asymmetric, and is thereby distinguished from the twitching of nervous disease, where the twitching is rhythmic and more or less symmetric.

The blood ordinarily shows a leukopenia (relatively small number of white corpuscles) during the first few

days, and gives the Widal reaction after four to seven days. This reaction is the clumping and rendering inactive of typhoid bacilli by mixing them with a little of the patient's blood. This is, of course, due to the development in the patient's blood of those "antibodies" which ultimately overcome the bacilli active in the system.

Typhoid fever is more apt to appear in youth, owing to the fact that the adenoid (or lymphoid) tissue, wherein the infection has its seat, is more plentiful then than later in life; but no age is exempt from the disease. On account of their general weakness, aged patients are more apt to succumb. Because of the development of the "antibodies" during the disease people do not ordinarily have the disease twice; but this immunity wears off with time, and people who have had the disease should not put too much trust in an acquired immunity.

Treatment.—As soon as the physician pronounces the disease typhoid fever, the family has two duties to perform: First, to see that the patient rests free from all exertion; second, to protect other people from the disease. Because the disease generally kills by exhausting the vitality of the patient we need to give the patient as much nourishment as is consistent with his impaired digestion and diseased organs, and we must keep him absolutely quiet in bed so that he will not use up one ounce of strength more than is absolutely necessary.

There are two types of diet in use at the present time: the one a high caloric diet, and the other simply milk and fruit juices. The former has the advantage of keeping up the patient's strength, but it has the disadvantage of being liable to much pain and distention. Therefore, it should not be used except where an expert physician and dietitian can watch the patient from day to day. For patients treated at home, or where the supervision is not of the most expert type the second type is preferable.

Some patients cannot take even ordinary milk; but most

of them can take the milk if it is predigested. The nurse should watch the stool carefully, and if curds of milk and other undigested food particles occur therein, the physician should be notified in order that he may change the diet. To predigest the food we secure tubes of powdered pancreatin and soda and stir the powder into warmed milk; then put the mixture on ice until needed. Of the fruit juices, unfermented grape juice is the most used. In any case, whatever the food, the patient should never be allowed to overload his stomach. It is better to give a glass of milk sipped slowly or fruit juice every two or three hours than larger quantities less frequently.

The patient should not be allowed to rise in bed or stir unnecessarily. He should not even rise for urination or defecation. Convenient and comfortable bed-pans and urinals should be at hand for such purpose.

The fever is combated best by the use of the cold sponge-bath. This is given with water at 60° to 65° F. It may be repeated twice or thrice daily if necessary. More robust patients may be dipped into the tub of cold water (the so-called Brand bath), but this is so strenuous that it should be done only under the supervision of a physician.

The nurse should wash her hands thoroughly after handling the patient. She should change her clothing when going off duty or mingling with other people. The bedding and clothing of the patient should be thrown into boiling water (and boiled) before sending it to the laundry. There should always be plenty of antiseptic solutions at hand for use on both skin and clothing. Just now the compound solution of the cresols (liquid cresolis comp.) is probably the cheapest of the effective antiseptics. This should be used in 2 to 5 per cent. solution. Crude carbolic acid is good in 5 per cent. solution. Bichlorid of mercury may be used in 1 : 1000 solution. Plenty of sunlight, fresh air, hot water, and soap are, however, to be depended upon more than drugs.

The chief means of contagion is, however, through the patient's excretions. These, therefore, should be sterilized before being disposed of. It is not sufficient to bury the dejecta; still less is it to throw urine and feces into the garden. Some good antiseptic solution, such as the milk of lime or crude carbolic acid (5 per cent.), should be poured over the excreta in sufficient quantity to cover them, and be allowed to stand for at least one-half hour before they are thrown into the sewer or privy.

When the patient is free from fever his appetite is ravenous, but it should not be indulged. The rule of small meals frequently repeated, which prevailed during the fever, still holds good. No food should be given not specifically authorized by the doctor. Steak specially broiled and oven-dried toast are generally permitted on the third day after the fever leaves. This is the first solid food. The amount and variety are then gradually increased.

Emergencies in Typhoid Fever.—There are, of course, many accidents and emergencies which the nurse must meet, because they must be met before the doctor can reach the bedside; of these the most common is abdominal pain. This is usually caused by the accumulation of gas in the bowels, and varies in location and character from moment to moment. The best treatment for such a condition, in general, is the application of the hot-water bag or cloths wrung out of hot water. Heat in a fever is not desirable, however; therefore, in typhoid fever the best results are obtained by causing the gas to pass off through the rectum by means of warm water enemata or by the insertion of a colon-tube. This latter procedure should not be undertaken by an inexperienced attendant unless under the eye of a doctor or a trained nurse. Abdominal pain should not be present if the diet and treatment are correct.

The most dreaded emergency is the perforation of the bowel, with the consequent onset of peritonitis. The

signs of such a calamity are usually a sudden, severe fall in body temperature, usually until it is below normal; an increase in the pulse-rate; the appearance of clammy perspiration on the forehead, and a pinched expression on the face. The physician denotes the condition as one of shock or collapse. If the nurse see such symptoms along in the second, third, or fourth week of the disease, she should at once call the physician. Before his arrival she can help matters by applying cold to the abdomen, either in the form of an ice-bag or cloths wrung out of cold water and changed frequently, and by keeping the patient particularly still. The only effective treatment for this usually fatal mishap is surgical interference. When the nurse detects the perforation almost as soon as it occurs, and an operation is immediately performed, the patient has a better hope of recovery than otherwise.

More common than the perforation is the intestinal hemorrhage. This, if unrelieved, will also prove fatal. Hemorrhage is usually detected by the nurse because she finds blood in the stools. Hemorrhage may also cause a fall in the body temperature, an increase in pulse-rate, and some distention of the abdomen. Here, again, the physician must be notified. Before his arrival the nurse may help matters by applying ice to the abdomen; and, if necessary, giving the patient tincture of opium in a one teaspoonful dose every two hours. The patient must be kept quiet. It is usually advisable to raise the foot of the bed from 4 to 6 inches.

The delirium of typhoid fever is more alarming than dangerous. It is nearly always present at some time during the disease, and may leave some illusions or hallucinations persisting even into convalescence. Rarely does the patient create a disturbance; therefore, the chief work of the nurse is to soothe the patient by gentle assurance that everything is well. Sometimes, however, the application of cold to the head will assist greatly. This is best accomplished by an ice-bag or head coil. Of

ice-bags, the best are those which have an outlet and tube to drain off the excess water. This keeps the temperature of the surface lower than when water is allowed to accumulate in the bag. The ice coil is simply a piece of $\frac{1}{4}$-inch tubing coiled to fit over part of the head. A bucket of ice-water is placed by the bedside 2 or 3 feet higher than the patient's head, and the water is passed through the tube into another bucket on the floor by the side of the bed by means of siphon action.

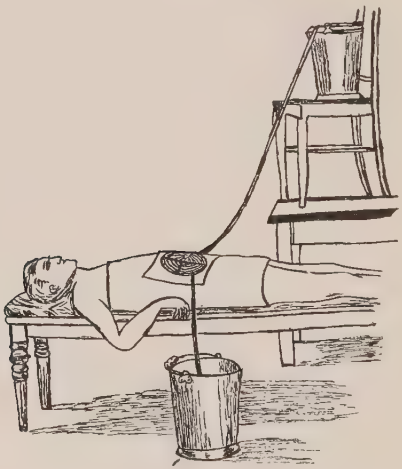

Fig. 24.—The Leiter coil.

Vaccination.—Nurses and others liable to exposure to typhoid fever should submit to an immunizing vaccination. This consists of three subcutaneous injections of dead typhoid bacilli in sufficient numbers to stimulate the building of antibodies (immune bodies). These injections are made at ten-day intervals with a hypodermic syringe. The injections may cause a day or two of fever and general discomfort; but the final effect is so good that it is well worth while to bear the pain. This

immunity will last probably for years, but at present we deem it wise to put through a second vaccination after the lapse of three years. Usually immunizing vaccines contain both the typhoid and the paratyphoid organisms.

Sometimes the same principle is used in the treatment of typhoid, especially where the patient does not seem able to produce antibodies for himself. Here the administration of the vaccine must be more delicately adjusted to the patient's condition and most carefully supervised.

Paratyphoid fever is similar to typhoid, but of shorter duration and of less danger. It is caused by germs closely related to the Bacillus typhosus of typhoid. These organisms are called paratyphoid (B. paratyphosus) and are of two types, designated as A and B.

Nowadays when immunizing (vaccinating) people against typhoid both the A and B paratyphoids are added to the vaccine. Such a vaccine is sometimes called a "triple" vaccine.

The treatment of paratyphoid is the same as that for typhoid.

Typhus Fever

Typhus fever (spotted fever, ship fever, jail fever), with which until in the last century typhoid fever was confused, is a disease of poverty and filth. It is rare now in the United States. A weakened form has gone under the name of Brill's disease.

It is a germ disease. It is carried from patients to others by lice and vermin. Therefore, in the trenches and prison camps in the World War, as in Serbia, it was easily communicated and became a veritable scourge. This mode of transmission makes necessary special attention to the bedding and clothing of the patient and to the walls and hangings of the sick room. Absolute cleanliness plus the sterilization of any suspicious material is the essential thing to stop the spread of the disease.

Typhus fever is caused by rickettsia. These are small

bacteria-like bodies probably belonging to the protozoa. They stain with difficulty; best with Giemsa or one of the modifications of Romanowski's stain. Rickettsia occur in pairs or clusters within the cells in cases of typhus and Rocky Mountain spotted fever, and without the cells in trench fever. They are small—a pair measure about 1 micron long. They do not grow in artificial culture-media. They are frail and easily killed. It is interesting to note that these organisms were so named in memory of Ricketts and Prowazek, both of whom succumbed to typhus while investigating the disease.

The disease has a course of some fourteen days and terminates by crisis. The incubation period lasts about twelve days. The onset is sudden, and attended with chills and fever and sharp pains in the head and back. The pulse is full and bounding. The tongue is coated. Vomiting is frequent.

After three or four days an eruption over the abdomen, chest, and then face and extremities appears. The rash is hemorrhagic in character and only the lighter spots disappear on pressure. At first the rash looks like that of measles, but later assumes the peculiar appearance and feel due to its petechial character. The patient is utterly prostrated and lies flat on his back, "with dull, expressionless face, flushed cheeks, injected conjunctiva, and contracted pupils" (Osler). The second week finds the symptoms more pronounced than the first, and delirium is usually present.

The fever course reaches its highest point (105° to 107° F.) about the fifth day, and then runs with only the daily variations until the crisis on the twelfth to fourteenth day.

In fatal cases death usually occurs at the end of the second week, and is due to exhaustion (and may be preceded by a sharp rise in temperature to 108° to 109° F.), except in those rapidly fatal cases (*typhus siderans*) where the end comes after two or three days. Sometimes the

patient may live until the third week and then be carried off by a pneumonia. The mortality is light in children, but reaches 50 per cent. among adults.

There seems to be no particular localization of the disease in the body, and the general degeneration in the vital organs is that characteristic of a severe and exhausting toxemia rather than that due to localized processes.

The treatment is similar to that of typhoid—especially the cool sponging, the dieting, and the stimulation.

CHAPTER IX

SMALLPOX—CHICKENPOX

Smallpox

Smallpox was known in the Orient from the earliest times and seems to have existed in China for a thousand years before the Christian era. The first mention of it in Europe was in 570 by Marais, the bishop of Avenches, who gave it its present name—variola.

It was the greatest scourge of mediæval times. Thus even as late as 1754 it was estimated that every tenth death was due to smallpox. And in 1782 Sarcone estimated that 90 per cent. of the people of Italy suffered from smallpox. Therefore, in those times, it was the most frightful of contagious diseases; and very few individuals, probably not more than 4 per cent. of all persons reaching the age of thirty, escaped attacks of this ever-present plague. Two-thirds of the entire infant population are said to have been attacked and a large mortality resulted. Westergaarde tells us that in Sweden during the decade of 1751–1760, 13 per cent. of all deaths were due to smallpox, a proportion far in excess of that caused by the white plague of today. During certain years the proportion in France rose to 10 per cent., while that in Liverpool has been as high as 20 per cent.

Toward the close of the eighteenth century Jenner finally brought smallpox into subjection. A very rapid decline in the mortality of this disease immediately took place, so deaths from smallpox have become an almost negligible factor in the records of present mortality statistics. If Sweden's mortality during the decade 1751 to 1760 were duplicated today, it would mean approximately 3000 deaths annually in a city of 700,000 population. Yet

in St. Louis, a city of this size, not a single death from this cause occurred in 1912.

The highest rate of mortality between 1900 and 1920 in the registered area in the United States was 6.6 per 100,000, and this occurred in 1902. Ordinarily the rate per 100,000 is less than 1, but occasionally some cities exceed that amount. For example, in 1920 New Orleans had 34.4; Salt Lake City, 4.2; Spokane, 3.8; Omaha, 2.1; Birmingham, 1.7.

The case mortality varies from 0 to 0.8 per cent., but occasionally epidemics occur in which the mortality goes as high as 40 per cent. or even 50 per cent. Thus, in Kansas City in 1921, while the mortality in other cities in the United States was, as I have indicated, less than 1 per cent., a form of disease developed in which the mortality exceeded 45 per cent. This epidemic type continued over into the year of 1922, so that the mortality was 65 out of 135 cases reported. Rosenau tries to explain this on the theory that there are two types of organisms—one much more virulent than the other—and that these epidemic cases are due to the more virulent type of disease.

Each year since then has shown the presence of localized epidemics in the cities of the United States. In some of these the mortality rate becomes high. This experience shows the necessity of rigidly enforcing the requirement for prophylactic vaccination.

Smallpox was formerly a children's disease simply because almost all adults had been attacked in early youth. Without quarantine facilities and with no knowledge of preventive measures, it was absolutely impossible for children to escape exposure to the disease. But today the average age of persons dying from small-pox is twenty-seven years. Vaccination has proved a most remarkable boon and has saved more lives than has any other specific for disease. So insidious is the contagion of smallpox that the method of vaccination is still necessary to protect

the community. Because of the practical elimination of smallpox largely through vaccination the average duration of life has been increased three and a half years. The opponents of vaccination have no sound argument to support their contention, for the historical evidence in favor of the use of vaccine is absolutely overwhelming (Mangold).

The disease is transmitted directly from person to person. The particular method of transmission is as yet

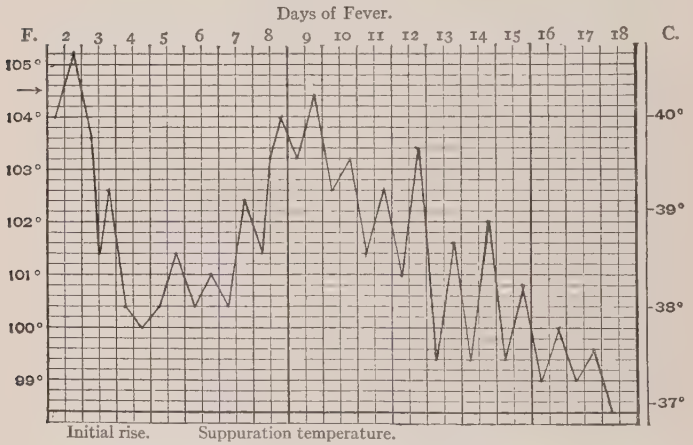

Fig. 25.—Temperature curve in smallpox (Sahli).

unknown; but the probabilities are that it is taken into the body through the respiratory tract.

The incubation period is from eight to fifteen days.

The onset is very much like that of influenza. The patient for the first two or three days shows a fever, with cough, vomiting, headache, etc., all the marks of a severe infection, but nothing that points to any definite localization of the disease. The fever may be quite high, but it usually goes down about the third day, when the eruption begins to appear, first on the forehead and then spreading

downward. In the fully formed eruption there appears a central depression which is characteristic of smallpox. Another characteristic is the feeling as if a small shot were embedded underneath the papule or macule when the finger is passed over it. The papule gradually fills with fluid (*i. e.*, a vesicle is formed), which is at first clear and then grayish, that is, purulent. Finally, the fluid contents dry up and the eruption comes off as a scale.

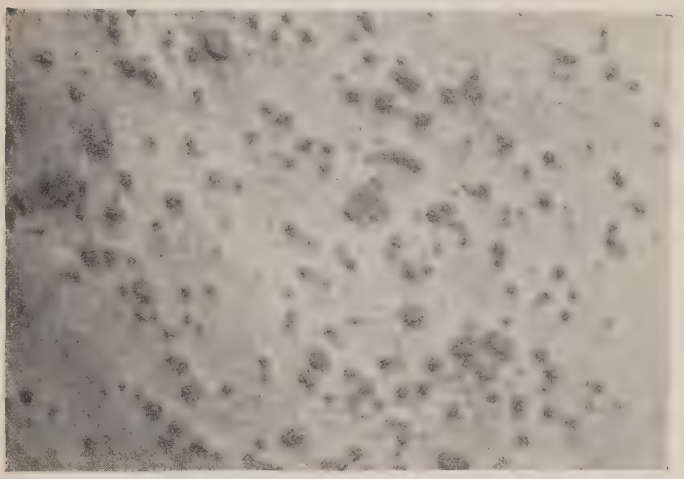

Fig. 26.—Close-up of eruption in a case of smallpox that recovered (Watson Campbell).

After the eruption has been out for a day or two the second fever period begins. This is a suppurative fever and lasts for from eight to eighteen days. When this high continued fever remits, then the greater part of the disease is passed.

The seriousness of the disease is proportional to the amount of skin surface involved. Thus the discrete variety where the papules are distinctly separated from each other is much lighter and rarely fatal. While the confluent type, where the papules all run together and

Fig. 27.—Eruption in a smallpox patient who recovered (Watson Campbell).

Fig. 28.—Eruption in a fatal case of smallpox (Watson Campbell).

there is no real healthy skin tissue left, death is the more probable outcome.

When hemorrhages occur in these papules we have the

so-called hemorrhagic, or black fever, which is usually fatal.

Treatment.—The first duty of the family is to isolate the patient; this should be in a house set apart from its neighbors or, better, in a specially constructed hospital for contagious diseases. Here the patient should remain about five weeks, or until desquamation has ceased and the skin is entirely smooth and clear again.

The patient with a severe case needs a great deal of care. His skin should be kept moist with an antiseptic oil or carbolized vaselin. If a child, the fingers should be kept covered with something soft to prevent scratching. The high temperature may be reduced by cold sponge-baths. The food must be carefully chosen and as carefully cooked.

Inasmuch as smallpox is easily transmitted by persons and objects, disinfection of all who have to do with the disease is very important. In the first place, the patient should be isolated, as we have noted above, not only in a separate room, but in a separate building. Then, the physician who visits the patient must be very careful about carrying the infection. There should be provided for him gowns which he can slip on outside the door. Before doing this he should remove his own coat and vest. After visiting the patient he should disinfect his hands and face and hair and beard by the use of corrosive sublimate solution or alcohol. The nurse must remain isolated, and should mingle with other people only when absolutely necessary, and then only after complete disinfection, which should include a change of garments and an antiseptic bath. The toilet and bath-room used by the patient or nurse should be disinfected daily with formalin or crude carbolic acid. In fact, everything that comes in contact with the patient should be either boiled or cleansed with a 1 : 1000 solution of corrosive sublimate or, if metal, exposed to formaldehyd vapor.

One great danger in treating a case of this kind is that

our solicitude for the patient prevents us from giving him good ventilation. There is a well-known fear among the people of such patients "catching cold" and thereby "driving in" such an eruption. Of course, such chilling is dangerous, but it is almost as fatal to keep the patient in bad air. For this reason great attention should be

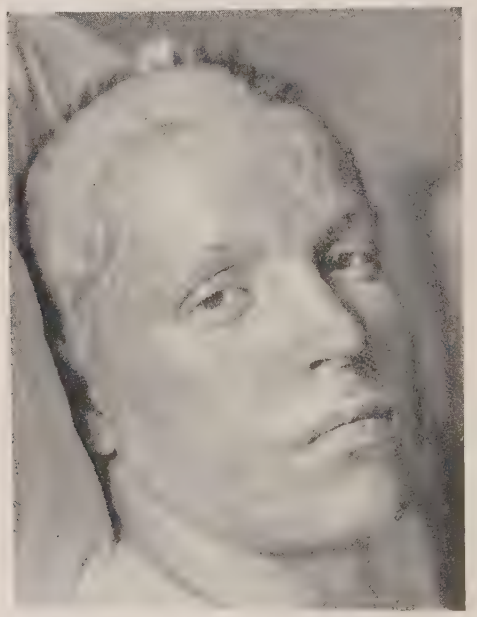

Fig. 29.—The pitting from smallpox (Watson Campbell).

given to keeping the air in the sick room constantly renewed; but seeing to it also that the patient is guarded by screens, so that he does not feel any draft.

Good results have been obtained by excluding all but the red light (actinic rays) from the sick room, *i. e.*, by having every inlet for light colored red. This is usually impossible of accomplishment without the greatest danger

of shutting off the ventilation. In hospitals it sometimes may be carried out.

If the patient survive the disease, it is exceedingly important that he be kept in bed until all danger of relapse is passed, and also of infecting others. It is better to keep him too long than too short a time. Before the patient is allowed to mingle with the world again he should be given a thorough antiseptic bath, the hair and the beard should be cleansed with alcohol (50 per cent.), and the body washed with 1 : 1000 corrosive sublimate, or alcohol, or both. If, however, the patient die, it is more than ever important that there be no public funeral; that the corpse be wrapped in an antiseptic sheet, saturated in a solution of 1 : 1000 mercuric chlorid, and that every precaution be taken to prevent the exposure of non-immunes.

Very great efforts have been made to prevent pitting, but with small success. The best results have been obtained by the use of the red light, as indicated above. Where this has been impracticable, fairly good results have been obtained by the bandaging up of the face and hands with 10 to 20 per cent. solution of ichthyol in glycerin and leaving these bandages on for as long a time as possible.

Since the disease is very debilitating, all sorts of sequelæ are apt to follow, varying from mental derangement to rheumatism; therefore, in the days following smallpox great attention should be given the convalescent, that he does not make a heavy drain on his bodily or mental powers.

Vaccination.—Vaccination as introduced by Jenner was the inoculation of cowpox from the udders of cows into the skin of the children who are to be protected from the disease. History has shown that it is a complete prevention of the disease and that it should be repeated every five to fifteen years. Ordinarily one is vaccinated during the first year of life, then again at eight to twelve

years, and again at the beginning of adult life, *i. e.*, twenty-one years.

Vaccination should preferably be done on the arm; the leg is harder to keep clean and harder to keep quiet, and therefore is usually sorer than is the arm.

It takes about three days for the vaccination to show itself by reddening the skin and producing papules. These reach maturity (*i. e.*, are filled with fluid) in about six days. After the tenth or twelfth day the vesicle dries up and a scab is formed which may remain adherent for a week or so. The scar, at first red, becomes white with time.

The chief precaution to be observed with vaccination is the keeping of the dressing put on by the doctor unmoved and in place for the necessary time. It should not be removed to see if the vaccination is "taking" or to satisfy idle curiosity, or even to stop itching. The patient may not feel at all unwell. On the other hand, he may have a slight fever, lose his appetite, and experience a general malaise. Infection from contamination, of course, produces the usual symptoms of abscess formation.

After the formation of the vesicles it is proper to apply antiseptics, such as phenolated camphor (carbolic acid crystals and camphor gum, equal parts, rubbed up to form a fluid), to the dressing. This assists in the effort to avoid contamination.

Sometimes a fever occurs from vaccination. It is called vaccinia. This is not contagious and is rarely ever serious.

It is good policy to have a revaccination done whenever one finds himself unexpectedly exposed to smallpox.

Smallpox in 1926.—The smallpox record for 1926 once again gives the United States the unenviable distinction of having reported more cases of this preventable disease than any other country outside of Asia. According to state reports, tabulated by the American Association for Medical Progress, there were 33,752 cases of smallpox in this country during 1926, distributed over 46 states and the District of Columbia, compared to 41,643 cases in 1925. Only

two states—Rhode Island and Vermont—were entirely free from the disease last year. The remaining New England states reported only 19 cases, as follows: Maine 12, Massachusetts 4, Connecticut 2, and New Hampshire 1. The 4 cases in Massachusetts were brought in by tourists from Florida.

The largest numbers were reported for Indiana (3571 cases), Florida (2890 cases), California (2794 cases), Washington (2413 cases), and Ohio (2133 cases). The mild type of the disease prevailed generally, the total number of deaths being 361, representing a fatality rate of slightly more than 1 per cent. There were, however, outbreaks of the severe form of the disease in the early part of the year in Los Angeles and Seattle; these largely accounted for the 236 deaths in California and the 31 deaths in the state of Washington.

According to figures compiled by the Health Section of the League of Nations, ten European countries had no smallpox in 1926, eighteen of them together reported less than 1000 cases, leaving three nations—Russia, Spain, and England and Wales—responsible for most of the smallpox in Europe during the year. For the first nine months Russia reported 5039 cases, and Spain 108 deaths. England and Wales had 10,222 cases in 1926 as compared to 5363 cases in 1925. It is significant that in both the United States and in England smallpox is most menacing where antivaccination sentiment is strongest—in southern California and in northern England.—*Bulletin of the American Association for Medical Progress.*

CHICKENPOX (VARICELLA)

Fortunately, this disease does not require a great deal of attention. Nevertheless, its symptoms are so similar to those of other eruptive diseases that they may cause confusion and some alarm. It is very contagious and has an incubation period varying from ten to sixteen days.

The disease begins with a slight fever (101° to 102° F.) and a feeling of chilliness, aching in the back and extremities, and sometimes with vomiting. After about twenty-four hours the eruption begins to appear, first upon the scalp and face, but most definitely upon the trunk (especially the back), with large isolated papules. These appear in crops and remain out for about four days, and then become filled with fluid, and finally dry up and disappear.

No particular treatment is needed; therefore the family usually takes complete charge of the patient. The sick room should be selected for its brightness, cheeriness, and

airiness; and then the patient kept in it for one week in spite of the fact that he often feels like running out on the streets. Special attention should be paid to keeping the nose, throat, mouth, and teeth clean. For this purpose a simple spray with an alkaline antiseptic solution, such as the "detergent gargle" of the National Formulary in 50 per cent. solution, would be helpful. Sometimes a gargle of the throat is needed, in which case the above or hydrogen peroxid would be good. The teeth should be cleansed two or three times a day with a brush wet in peroxid of hydrogen of the strength ordinarily sold in the stores. It is very important that the bowels be kept open, and, therefore, a laxative diet, as well as small doses of calomel or salts, should be used as the occasion demands.

It is well not to indulge the patient's craving for food too much. A large part of his craving arises from the fact that he has nothing to do except eat. For this reason it is a very good plan to give the patient liquid food every two or three hours, at least during the fever period. This food might vary from meat broths to milk or cocoa.

Inasmuch as there is a possibility of confusing chicken-pox with mild cases of smallpox or similar diseases, it is well to have a physician make the diagnosis; and it is, to say the least, extremely unpatriotic not to establish a quarantine that will prevent the spread of the disease.

CHAPTER X

WHOOPING-COUGH (PERTUSSIS)

Prevalence.—Whooping-cough had a mortality of 6.7 per 100,000 in 1925. Thus it followed diphtheria, which had 7.8, and preceded measles (2.3). The case mortality

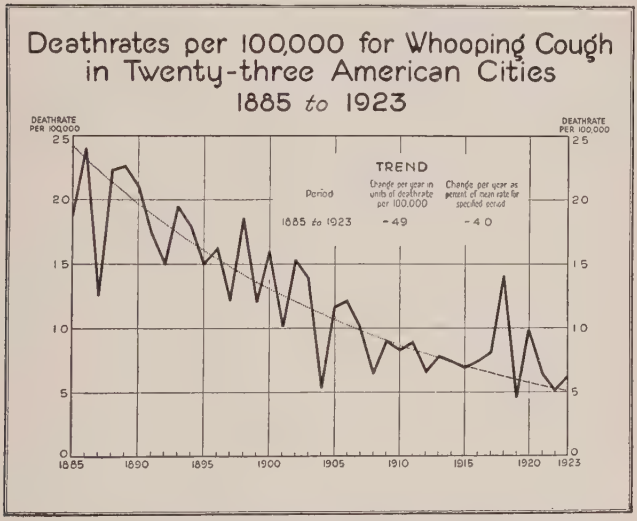

Fig. 30.—The whooping-cough rate in 1926 was 40 per cent. greater than in 1925. (From the Statistical Bulletin of the Metropolitan Life Insurance Co.)

in children under one year is less than 1 per cent.; in those between one and two years, 15 per cent., and for the older ones it varies from 5 to 15 per cent.

Character.—The disease is a tracheobronchitis which is characterized by a series of violent spasmodic coughs

ending in a long-drawn inspiratory whoop. It is dangerous because of its sequelæ and complications, the most serious of which are bronchopneumonia and tuberculosis.

Age.—It is a disease of young children, the greatest number of cases occurring between the first and second dentitions.

Immunity.—One attack almost invariably confers immunity. Consequently, a second attack is extremely rare.

Occurrence.—It is usually epidemic in type; and these epidemics occur most often in winter and spring. Epidemics of whooping-cough and measles seem to occur together—the one following the other.

Transmission.—The transmission is by droplet infection—that is, contact. The disease seems to be most contagious during the first or catarrhal period.

Bacteriology.—It is generally admitted that the minute bacillus described by Bordet and Gengou is the cause of the disorder. This bacillus is found chiefly between the cilia in the lower portion of the trachea and the upper parts of the bronchi. The effect is to clog the action of the cilia and in some cases to cause them to break off or even disappear. This naturally causes an irritation of the throat.

Complications.—The ordinary cause of death in this disease is bronchopneumonia from an extension of the disease downward. The second complication is the lymphadenitis or enlargement and inflammation of the peribronchial lymph or hilus glands that are found at the bifurcation of the trachea. These swell up and cause considerable distress. Another unpleasant complication of the disease is the breaking of blood-vessels caused by the violent paroxysms of coughing. This type of hemorrhage is best observed in the eyes when the subconjunctival bleeding turns the whites red. The strain of coughing may be so great as to cause acute dilatation of the heart, and thus death.

Symptomatology.—The course of the disease is usually

divided into three periods: first, the prodromal or catarrhal stage; second, the paroxysmal or spasmodic stage; and third, the stage of recovery, during which the spastic cough disappears. This sequence of events, however, does not always hold good; for there may be an omission of the first or of the third stage.

The catarrhal stage presents the symptoms of an ordinary cold. There is slight fever, running of the nose, congestion of the conjunctiva, and coughing. This stage lasts from a week to ten days.

The paroxysmal stage begins at the time of the first whoop. There is a sensation of pain under the sternum and a prickling or tickling of the larynx or trachea. The coughing fit commences with the noisy expiration followed by a series of from fifteen to twenty forcible frequent coughs of increasing intensity. During this time no inspiratory effort is made, and as a result of the expulsion of the air from the lungs there are signs of cyanosis. The face becomes swollen and congested. The veins become prominent and the eyes protrude and become watery. The attack terminates with a long, convulsive coughing or whoop or occasionally with sneezing. The seizure may last from a few seconds to a few minutes and is apt to be more frequent at night than in the day. The attacks are precipitated by crying, emotion, and inhalation of dust. Vomiting occurs frequently with the paroxysm and may be so bad that the child becomes weak from loss of food. Trousseau's description of an attack is quoted by Norris and Landis as follows: "Owing to the intense distress the child learns to dread succeeding attacks. At first he tries to avert the paroxysm. Instead of breathing naturally and expanding his lungs to the full, as he was doing just before, he holds his breath. For it seems to him that the full current of air entering his larynx will produce an exhausting cough of which he has had a sad experience. The fit takes place. You at once see the patient look around for a support to which he may cling.

If he is a child at the breast he throws himself into the arms of the mother or nurse. If he is older and able to stand up, you notice him stamping in a state of complete distress. If he is lying down, he sits up quickly and clutches hold of the curtains or of the rails." The effort at coughing may cause the rupture of the capillaries. Thus, one sees hemorrhage in the eyes, nosebleed, the coughing up of blood (hemoptysis), and even paralysis. This spasmodic stage lasts from three to six weeks.

The third stage is seen after a decrease in the frequency of the paroxysms and is characterized by the gradual disappearance of the attacks. The cough becomes looser and the sputum less tenacious and more mucopurulent.

Diagnosis.—There are no physical signs peculiar to whooping-cough except the character of the whoop. Consequently, it is not possible to make a certain diagnosis of whooping-cough except by hearing the whoops. Therefore, only a probable diagnosis can be made during the catarrhal stage; for the same introductory symptoms are found as in measles and bronchitis.

Sequelæ.—The most fearsome of the sequalæ of the disease is tuberculosis.

The reason for the development of tuberculosis so frequently after whooping-cough is that the severe paroxysms of coughing seem to be able to stir up a tuberculosis that was, up to that time, latent. Moreover, since the cough leaves the patients emaciated and weak, the general resistance of the body against tuberculosis is decreased.

Treatment.—The treatment may be summarized thus: If possible, the children should be kept in the fresh air and sunshine. Where the weather conditions will not permit of their going out doors, the air of the room should be moistened with steam charged with balsams. Ordinarily it does no hurt to let the child play about in the open air. But the children are not benefited by letting them play in the dusty and dirty streets. They should be sent to the country if there are no lawns or clean yards for their use.

Abdominal distress and extreme dilation of the lungs seem to be prevented to some extent by the use of tight abdominal binders.

The vomiting of the food is usually prevented by giving the children about one-half hour before mealtime a drink of hot water or hot lemonade or even hot bouillon. This causes usually a paroxysm of coughing, thereby cleaning out the trachea and leaving a condition more favorable for the ingestion of food.

Specific Treatment.—The use of vaccines made from the bacilli of Bordet-Gengou has seemed to shorten the attacks. These vaccines are administered every day for three to six doses. As yet there is no serum treatment.

Prophylaxis.—The period of isolation should extend beyond the stage of the paroxysmal cough. Children exposed to the disease can with benefit be given a course of the vaccines just mentioned under Treatment. This seems to afford them increased immunity.

The sputum of these patients is infectious and must, therefore, be gathered up and disinfected with the same care as the sputum of other patients suffering from respiratory disease.

CHAPTER XI

MALARIA

Malaria is due to an invasion of the blood by a micro-organism of the protozoan class; that is, an organism more highly organized and complex than the bacteria which cause most of our infectious diseases. It goes through several stages of development, in which it assumes different forms and lives under different conditions—just as a butterfly must live as a worm at one stage, and as a chrysalis at another. But the malarial organism (called plasmodium) appears to have two different types of development—the one asexual, the other sexual. Plasmodia of the latter group cannot spend their entire life-cycle in human blood; that is, they cannot live and multiply in the blood alone, but must spend some of their existence outside of the human body. While in the blood they live within the red corpuscles themselves. When they reach the stage when they should pass out from the body they shatter the corpuscles in which they have been living, and divide into many segments, each of which assumes an independent existence and swims about free in the blood-plasma. When this occurs the patient has fever and chills, with all the other symptoms symbolized by the word "malaria." The other part of the life of the micro-organism is spent in the Anopheles mosquito. It reaches the mosquito when the latter bites a patient ill with the disease and sucks up the blood. From the bill the organism reaches the digestive tract of the mosquito. After a few hours it burrows into the wall of the mosquito's intestine and passes thence into the tissues of the mosquito, changing its form, becoming what we might call the larva of the original protozoön. When it becomes

mature enough to pass again into the human being the micro-organism wanders through the tissues of the mosquito to the salivary glands at the base of the pro-

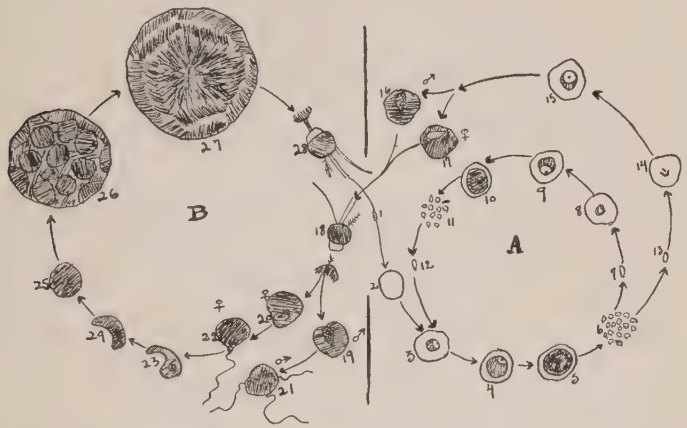

Fig. 31.—Diagram of the two types of life-cycles of the malarial plasmodium. *A*, Asexual cycle: 1, Sporozoïte introduced into the body by the mosquito (28) and on its way to the blood-cell (2); 2–5, young form in a blood-cell; 4, the half-developed form; 5, ready to burst; 6, daughter-cells (merozoites) set at liberty; 7, an individual merozoite on its way to a new cell; 8–11, second generation developments; 12, second generation merozoite on its way to a new cell; 13, free merozoite of second generation; 14, young gamete; 15, adult gamete; 16, microgametocyte (male) and 17, macrogametocyte (female form) free in blood awaiting their chance to enter the intestine of a mosquito (that is, 5 to 12 are asexual and 15 to 16 and 17 are sexual types). *B*, Sexual cycle: 19, Microgametocyte (male), and 20, macrogametocyte (female) in the digestive tract of the mosquito; 21, microgametocyte giving out microgametocytes, one of which is on its way to fertilize the macrogametocyte 22; 23 and 24, oökinetes; 25, oökyste or zygotes; 26, cyst containing sporoblasts; 27, cyst containing sporozoïtes; 28, mosquito inoculated with sporozoïtes. (After Vincent and Rieux.)

boscis, so that when the inhabited mosquito pushes its proboscis through the skin of a human being the micro-organism passes easily into the fluids of the individual bitten.

The asexual group may remain and multiply in the blood. Their cycle is nearly the same as that just described except that they do not need to leave the blood. Consequently, since malaria always has some plasmodia of this type, it can continue indefinitely.

The malarial plasmodia belong to different groups, each of which has a definite period of existence. Thus, one species of plasmodia (Plasmodium vivax) matures and breaks out in approximately forty-eight hours; another requires seventy-two hours (Plasmodium malariæ); and still a third kind (Plasmodium falciparum) breaks out at more or less irregular intervals. Hence, when the first class of plasmodia infects a patient, he has chills and fever every third day; the second class gives him chills and fever every fourth day; while the third class gives him an irregular fever. The first class is called tertian; the second, quartan; and the third, estivo-autumnal malaria. If he has fever every day it is usually due to a double infection.

The diagnosis of malaria, therefore, depends on finding these organisms in the blood. But inasmuch as they are not equally present at all times in the peripheral circulation, several examinations may be needed before a sound conclusion is reached.

Historic. — Malaria has been known from earliest times. It was well described in the writings of Hippocrates. Nothing distinctive was added to his descriptions (although Sydenham gave an excellent description of the fever in 1665) until the discovery in 1834 that quinin or, better, cinchona was a specific in the treatment. There it rested until the work of Laveran in 1880, which showed that paludism, as the French call it, was due to these small bodies found floating in the blood-stream.

The mode of transmission was worked out by Ronald Ross of the British Indian Army, who published his works in 1895–97.

Malaria is endemic in the greater part of the world. Thus it is known between 50 degrees north latitude and

20 degrees south latitude. This range includes practically all of Asia, all of Africa, America, and Australia. As the French name, paludism, indicates, the disease is found in the lowlands where the mosquitoes can grow easily—as in swamps. How virulent the disease may be in such foci is shown by the experience in the war of 1914–18, of the French expeditionary army in the Orient which paid a heavy penalty for invading the foci of this disease in Asia Minor. It is the presence of malaria in the tropical countries that makes these lands so dangerous for man, especially the white man.

The situation was well illustrated in the case of the Panama Canal Zone. Here, where hundreds of laborers and engineers had died in an attempt to build a canal for the French, Dr. Gorgas made a successful campaign to destroy the mosquitoes and their breeding places (and thus the transmission of malaria), and not only made it possible to build the canal, but made the canal zone as healthy a place to live in as any part of the United States.

Prevalence.—There are probably a million cases of clinical malaria in our southern states each year, and the carriers far outnumber the cases.

"During the past ten years the malaria death-rate has declined from one year to the next at an average rate of 14 per cent. for a group of fifty-one southern and southwestern cities, and of $15\frac{1}{2}$ per cent. among policy-holders in the Industrial Department of the Metropolitan Life Insurance Company. In 1911 the fifty-one cities had a malaria death-rate of 14.1 per 100,000 of population, and in 1920 a rate of 3.15, which represents a total decline in ten years of 75 per cent." In 1925 there were reported in the United States 2131 cases with a mortality rate per 100,000 of 2.1.

Incubation Period.—The incubation period of all forms varies from ten to fifteen days, more usually from twelve

to fourteen days. When the incubation period is longer it is due to the taking of quinin or to some increased resistance on the part of the victim.

General Effects.—The disease produces a diminution of the red cells, a decrease in the hemoglobin, an increase in the nuclear rests, and a decrease in the white cells (leukopenia). The mononuclears are increased, that is, the transitory and the large types. The spleen is enlarged, and so, to a lesser extent, is the liver. The kidneys are affected and the urine, in severe cases, is smoke colored (as in *blackwater fever*) by the hemoglobin from the destroyed red cells.

The Carriers.—The anopheles mosquitoes which carry the infection are brownish and rather large. They may be distinguished by the fact that the palpi in both the male and the female are at least as long as the proboscis. Only the female transmits the infection. It sits more or less at right angles upon the wall, the head, thorax, and abdomen being in a straight line. In contrast with the habit of the yellow fever mosquitoes, the malarial mosquito is nocturnal in its habits and breeds in the open ponds, puddles, and natural collections of waters in the woods, fields, and swamps. The mosquito becomes infected upon drinking the blood containing the micro- and macrogametocytes. It requires about twelve days before the sporozoïtes appear in the salivary gland of the insect. It cannot, therefore, transmit the infection to another person until the lapse of this extrinsic period of incubation. The infected mosquito may live a long time and infect more than one person successively. The malarial parasite does not seem to harm the mosquito. It is important to note that the parasite will not develop in the mosquito when the mean temperature is below 60° F.

Symptoms.—The symptoms of an acute attack of the tertian or quartan type are a cold stage lasting from one-half to one-quarter of an hour, during which time the face becomes blue and pinched, the pulse rapid and small,

the urine increased, but the temperature may be as high as 106° F. The hot stage follows and reaches its maximum in an hour or two. Here the face is congested, the pulse full and bounding, headache is intense and throbbing, delirium may be present, urine scanty, thirst increased, temperature same as in the cold stage. The sweating stage is the stage of abatement. All the symptoms gradually disappear and the patient feels well. The whole attack lasts from eight to fourteen hours.

The *estivo-autumnal malaria* tends to produce a fever of the remittent (bilious) type. The temperature is not so high as in the tertian or quartan attacks described above. Jaundice is common, as is also epigastric pain. The gastro-intestinal symptoms are so pronounced that it may be mistaken for typhoid fever or vice versa. The fever usually gradually declines without any sweating stage.

Pernicious malaria is found more often in the tropics, and appears in three forms:

(*a*) Choleraic, with low temperature, vomiting, choleraic diarrhea, cyanosis, feeble and rapid pulse, collapse, and great mortality.

(*b*) Comatose, with a regular malarial paroxysm followed by stupor, hyperpyrexia, Cheyne-Stokes' respiration, and collapse ending in coma.

(*c*) The hematuric form, with blood in the urine and hemorrhage from the mucous membranes. Here there is no febrile paroxysm.

The long continuance of malaria produces a cachexia, with bleeding of the mucous membranes, uterus, and kidneys. The skin is of a peculiar sallow hue, malaise is constant, and the spleen is enlarged.

We would reiterate the necessity of using a microscope to determine whether or not the patient ill with chills and fever has really malaria; because that same sequence of chills and fever might be produced by tuberculosis, pyemia, ulcerative endocarditis, and empyema.

Treatment.—The treatment of malaria has fortunately become specific, and we have in quinin a remedy which will kill the plasmodia. Of course, besides the quinin, general and sensible means of treatment must be used, such as proper diet, proper cleansing of the skin, and proper evacuation of the bowels. The patient should be put to bed, kept quiet and warm, bathed once or twice a day, and fed on very easily digested food. A long continuance of malaria necessarily produces marked changes in the blood and internal organs. Therefore, such a patient should be aided by a line of treatment the chief end of which is to stimulate the regeneration of the blood and the restitution of the liver, spleen, and other organs particularly affected by the disease. This demands excellent food, consistent steam and hot-air baths, massage, and judicious exercise. Such drugs as arsenic and potassium iodid may be found useful, but, in general, institutional treatment, wherein the patient's whole life may be regulated, will be found most effective.

Malaria is quite resistant to treatment, in that at intervals of about three months after an apparently successful treatment the fever may reappear. This is due to the "hatching out" of embryos that had been developing at the time when quinin was given. Therefore we need to give the quinin for many days after the symptoms have disappeared, or take short courses of it at frequent intervals for three or four months following an apparent cure.

Prophylaxis.—From the standpoint of public welfare the actual care of the patient is of less importance than the prevention of the spread of the disease. There are two steps in the solution of the problem. The first is to prevent the infection reaching the mosquito, and the second is to exterminate the mosquito. First, then, mosquitoes should not be allowed to bite the patient ill with malaria, because in this way they get the material to infect other people. Every patient ill with malaria

should be screened off and otherwise protected from mosquitoes.

Second, the hatching out of young mosquitoes should be as nearly as possible prevented. This can be accomplished by two measures applicable to every community: First, the land should be drained and all stagnant pools cleaned out; second, all necessary pools and water reservoirs should be covered every fortnight or ten days during the warm seasons with a film of petroleum. This prevents the young mosquitoes (larvæ) from getting the air necessary to live and therefore suffocates them, and also prevents mature mosquitoes from laying their eggs in such water. It therefore lies in the power of any community to free itself from mosquitoes and malaria.

If one lives in a malarial country where one has not the power to proceed against the colonies of mosquitoes, then one should avoid going out after dark, and one should have all the doors and windows of the house thoroughly screened. Furthermore, it is well to take small doses of quinin regularly.

CHAPTER XII

THE INFECTIOUS DIARRHEAS (INCLUDING CHOLERA)

THERE are a number of types of diarrhea, especially in children, that seem to be infectious. But the nomenclature covering these has not yet become uniform and universal. Consequently, it is necessary to think of them primarily as types of ileocolitis, that is, of inflammation of the bowels, and to utilize the popular names only as explanatory of the pathologic condition.

Thus we have the term *cholera infantum*. This is an acute disease of childhood, characterized by high fever, vomiting, purging, and collapse. Frequently, it may be due to a toxemia, but quite often it is due to an infection, such as that which causes bacillary dysentery.

So also *cholera morbus* is a disease similar to cholera infantum, but in older children. The symptoms may not be so severe. It is a "summer complaint" and may be due to the eating of unripe fruits, change of temperature, etc., but, on the other hand, may often be due to the bacillus of dysentery.

Again, *cholera nostras*, which simulates the symptoms of cholera Asiatica (described below) is sometimes a toxemia due to bad food, sometimes due to the bacillus of dysentery and, therefore, infectious.

"Summer diarrhea" is of the same general character and should probably be classified with the infectious as often as with the toxic (or food poisoning) type.

The terms *diarrhea* and *dysentery* are often used to refer to the same type of disease. In general, however, "diarrhea" is used to indicate a milder inflammation than "dysentery." This viewpoint indicates the necessity of considering all acute diarrheas as potentially infectious until investigation has proved them otherwise.

It follows, therefore, that the dejecta and excreta of patients with diarrhea should be cared for so as not to pass the infection along. In particular, the access of flies to the patient and his excreta should be prevented in the most rigid way. It is because of the possibilities of transmission in these disorders that we go rather into details in the consideration of the more important forms of dysentery.

The term "dysentery" was introduced by Hippocrates to denote a condition characterized by the frequent passage of stools containing blood and mucus, accompanied by straining and tenesmus.

From the earliest times there have been regular epidemics of dysenteries, and in England from the beginning of the seventeenth to the middle of the nineteenth century epidemics of bacillary dysentery appeared more or less regularly at twenty-four-year intervals. It would seem as if the disease would attack each generation, render the survivors immune, and then wait for the non-immune offspring (Wilbert C. Davison). Mild, sporadic cases of bacillary dysentery still occur in England and in the United States more frequently than is generally recognized. At present the disease of children frequently escapes official notice by masquerading under other names, of which ileocolitis and infectious diarrhea are the more common. Under the blanket term "summer diarrhea" many cases of infantile diarrhea are hidden. Although we seldom see epidemics such as were recorded in this country in revolutionary times, yet many sporadic cases still occur.

Practically every long campaign and extended siege in wars since the memory of man has produced an epidemic of dysentery. The emerods with which the Bible states the army of the Philistines was smitten are now interpreted as prolapses of the rectum occurring in epidemic dysentery. During military campaigns Edward I and Henry V of England died with the disease. Seventy-

five per cent. of the latter's army succumbed to dysentery. In the Great War the hospital ships from the Dardenelles carried back loads of the victims of dysentery. The Belgians and British in Flanders, the British in Salonica, Gallipoli, Mesopotamia, Palestine, and Egypt, and the French in the Argonne and the east suffered also. While the American armies, though later in entering the war, had numerous cases at Chateau Thierry and at the base ports. The Germans and Austrians suffered especially along their eastern fronts and even found a new type of dysentery bacillus among their Rumanian prisoners.

Dysentery is usually due to infection with the Bacillus dysenteriæ, or the ameba (Entameba histolytica), but in rare cases symptoms of dysentery may be due to other parasites, such as Balantidium coli, lamblia, trichomonas, ankylostoma, schistosoma, paragonimus, Chilomastix mesnili, and bilharzia, which up to the present have received little attention.

The bacilli of dysentery may be separated into two groups: the Shiga and the Flexner group. The Flexner group contains at least five subvarieties.

The bacilli exude two types of toxins—an exotoxin, which has a great influence on the nervous system, and an endotoxin, which has considerable detrimental influence on the bowel.

In the sporadic cases of dysentery in children the Flexner bacillus is more common than the Shiga variety.

The diagnosis should be made by the agglutination reaction from the patient's serum because the identification of the bacilli in the stool specimens requires something like fourteen days, and the other reaction can be made within a few hours.

Typical cases of amebic and bacillary dysentery, typhoid, paratyphoid, cholera, and food-poisoning present characteristic clinical pictures, so that when these cases lie side by side they can as a general rule be distinguished.

However, it must be remembered that even in the presence of an epidemic of any one of these diseases it is occasionally impossible without laboratory confirmation to state that an individual case is of the prevailing type. Among the number of cases sent back from the Dardenelles as amebic and bacillary dysentery Davison found some due to infection with Bacillus paratyphosus B, although clinically they were indistinguishable from the remainder of the convoy. Inasmuch, therefore, as we have effectual specific remedies for amebic and Shiga dysentery in adults, the accurate laboratory differentiation of these cases from Flexner dysentery and other diarrheas is most essential. Clinical appearances alone are not reliable.

Bacillary Dysentery

The incubation period of bacillary dysentery varies from one to eight days.

Onset.—The prodromal symptoms are general malaise, fever, headache. The onset is usually characterized by a griping pain in the abdomen and an urgent desire to defecate, resulting in the passage of the ordinary formed feces which temporarily relieves the pain. The pain, however, soon returns, usually in the umbilical region, although other locations are frequent, associated with a desire to defecate and the passage of stools which are of a softer consistency and may be streaked with blood. These attacks are repeated at increasingly short intervals, so that the patient is more or less continuously at stool. Frequently the stools contain nothing but bloody pus. They are usually acid in reaction. The griping pains in the abdomen are doubtless due to the passage of intestinal contents over the inflamed mucous membrane.

Many afebrile cases of non-bloody, non-mucous diarrhea of but twenty-four hours' duration have been proved to be due to infection with dysentery bacilli. In fact, so-called epidemic diarrhea is usually mild dysentery. In

the northern cities of the United States the majority of the cases occur sporadically and are of this type.

As a rule, the stools become slimy and bloody on the second or third day and very soon are composed of pure blood and mucus. Later the mucus becomes thick and colorless with less blood, and finally there is the mucopurulent stool so characteristic of bacillary dysentery. The stools are usually small. They have a stale, spermic odor, and are generally not offensive. In severe cases, however, they may become exceedingly foul and contain pus. It is possible that this represents the secondary infection of streptococci or other pus-producing organisms. That is, the foul stools are an unfavorable sign. The urine is diminished in amount. Vomiting is unusual. The tongue is usually coated with white fur. The temperature in all but the very mildest cases rises to 101° to 104° F. In mild cases the febrile curve may be intermittent throughout, but it often assumes a remittent type for the first few days and gradually declines to normal in the morning, while still rising to 100° to 102° F. in the afternoon. The pulse increases in frequency and in the more severe infections becomes very small. In adults, if the patient is to die, the stools become serous, the pulse rapid and irregular; the temperature drops to subnormal, the number of stools may diminish, hiccup appears, and death due to exhaustion generally occurs during the second or third week.

In occasional cases instead of diarrhea constipation may be the predominating symptom; for the disease may be limited to the lower bowel and feces may be accumulating in the higher regions of the colon—a condition which may be recognized by distention.

The nervous symptoms due especially to the Shiga exotoxin are peripheral neuritis and paralysis, chiefly paraplegia. Delirium is rare except as a terminal symptom.

Recovery takes place as soon as the body can produce sufficient antitoxin to neutralize the endotoxin and thus prevent further destruction of the mucosa.

The duration is four to eight days in light cases, and three to six weeks in severe. Shiga found an average duration for all cases of forty days under medicinal treatment and twenty-five days under serum therapy. Relapses are common. Reinfections, except for relapses, are rare in bacillary dysentery.

Fletcher and MacKinnon, in a recent study of 1782 British soldiers convalescent from dysentery, some of whom gave histories of intermittent dysentery dating from the Boer War, found 74 still excreting dysentery bacilli. The average Flexner carrier was in good health, the stools were formed, and were free from blood and mucus. He was fit to carry on his work unless subjected to very adverse conditions of temperature or labor which might induce attacks of diarrhea. The Shiga carrier, on the other hand, was generally an invalid. The stools usually contained blood and mucus and he had frequent attacks of diarrhea. Furthermore, he often became a mental wreck.

Complications.—The complications are perforation and gangrene of the colon and peritonitis (which are altogether rare); abscesses are occasionally reported; arthritis and rheumatic pains are quite frequently noted; parotitis occurs in severe cases; edema and ascites are often seen in debilitated patients and during convalescence; functional disturbances of the heart have been common in some epidemics; beriberi has been noted as a frequent complication in Japan.

Stenosis of the large bowel, more particularly of the sigmoid flexure, proctitis and periproctitis due to cicatricial contraction of the healing ulcers, are among the most important sequelæ of dysentery. Suprarenal insufficiency and postmortem lesions of the suprarenal glands almost identical with those due to diphtheria toxin have been found during epidemics of severe Flexner dysentery. Chronic gastritis and intestinal ulcerations, pain, meteorism, diarrhea, and dyspepsia may follow dysentery.

Diagnosis.—The blood-picture differs in the two types

in that the white blood-count of the amebic dysentery is greater than in the bacillary. The amebic varies from 20,000 to 40,000, while in the bacillary type it rarely exceeds 15,000.

A presumptive diagnosis of bacillary dysentery can be made in the temperate climates or during epidemics when the patient has had a febrile onset, passes frequent bloody mucous stools, and has colic, tenesmus, resistance over the large bowel, palpable thickening of the walls of the colon, and pain on abdominal pressure.

The most important points in the differential diagnosis between amebic and bacillary dysentery are:

First: The onset is usually acute in bacillary dysentery, and gradual in amebic.

Second: Amebic dysentery usually runs a chronic course.

Third: In the amebic form no dysentery bacilli can be found except in the mixed infections of both the bacillary and amebic dysentery.

Fourth: In amebic dysentery toxic symptoms, such as high fever, general malaise, anorexia, rapid emaciation, and various nervous symptoms are not usually observed.

Fifth: In bacillary dysentery liver abscesses are never present. It is a frequent complication of amebic dysentery.

Prognosis.—Five per cent. of the cases tend to become chronic. The mortality lately has been only about 1 per cent. It used to be much greater.

Treatment.—As soon as the presumptive diagnosis of bacillary dysentery is made the patient should be sent to bed and kept as quiet as possible. He should not be permitted to get up until the stools are practically normal and the fever has subsided. Morphin should be used. The food should be diminished and even water by the mouth is not wisely given as long as vomiting persists. But water should be given in large quantities through the veins; or, in adults, through the rectum. If this is given in the form of a normal saline solution it is well. Sterile normal saline or 5 per cent. glucose should be given in-

travenously in amounts from 125 to 500 c.c., according to the size of the patient. Instead of normal saline von Jaksch recommends the injection of a solution containing sodium chlorid, 15; calcium chlorid, 0.45; potassium chlorid, 0.7 in 1 liter of water. The rectal drip is important wherever it can be used. The nasal drip has been used in children.

In the Shiga infection a potent antidysenteric serum should contain antibodies against the exotoxin, as well as the endotoxin. And such sera and antitoxins are now obtainable. Shiga gives the following rules for their use:

One: In mild cases the serum is injected once in a dose of 10 c.c.

Two: In cases of medium severity the serum is injected twice in doses of 10 c.c. The interval is from six to ten hours.

Three: In severe cases the largest amount is injected—40 to 60 c.c. But the subsequent daily dose does not exceed 20 c.c.

Davison uses two or three times these amounts.

In the Flexner infection the sera are of less advantage.

Irrigation of the colon should be used wherever possible. In obstinate cases irrigation and flushing of the colon through a colostomy or appendicostomy wound has been advocated. The nursing and general care should follow the principles laid down at the end of the chapter (p. 180).

Transmission.—The Osler triad of "fingers, food, and flies" is the most important factor in the transmission of bacillary dysentery. And most of the authors think that flies are largely responsible for the epidemics. The cleanliness of food is evidently the most important thing to be sought in the presence of this infection.

Prophylactic vaccination has been tried, but the results are not enthusiastically received. They cause a severe reaction and the immunity lasts only two or three months.

Amebic Dysentery

Although this is really a tropical disease, still many cases are being found in the United States and Europe It is, therefore, to be suspected in many cases of bowel trouble.

Strong defines it as an infectious disease characterized by a variable mode of onset, a course of great irregularity, intestinal disturbances consisting chiefly of intermittent attacks of diarrhea and constipation, abdominal pains, and the presence of a fever, and frequently of mucus and blood in the dejecta.

In the tropics it is most common after the heavy rains have begun. In the United States it occurs in the summer months—May, June, July, and August.

Males are more often affected than females, and children under ten years of age are often found with the disease.

The large intestine is chiefly involved. The most striking feature in chronic cases is the great thickening of its walls. This may be confined to the submucosa or involve all the coats. It is always more marked in the submucosa and is due to a general edema and localized areas of thickening.

The *symptoms* vary greatly. In mild cases the patients are not able to tell when they began to feel ill. There may be a complaint of lassitude, or of becoming easily tired, or of having continuous light headaches, more or less abdominal discomfort, and dyspepsia. Light intestinal disturbances consisting of moderate diarrhea or constipation may appear. Robust men may have the disease for a month or two without being aware that they are suffering from a serious malady.

In acute cases there may be fifteen to fifty or more bloody mucous movements in twenty-four hours. A high leukocytosis is frequently present. Colicky pains in the abdomen with tenesmus occur. Fever, nausea, and vomiting may appear. Great exhaustion sets in. The heart

action becomes feeble and death results, or the condition temporarily improves and gradually assumes a chronic form. It is in this form that wild delirium may appear before death.

In the advanced stages the symptoms become well developed—the movements become more frequent and usually contain much mucus and blood. Their number may vary from two or three in the morning to ten or fifteen or more during the day. There is aching in the back, a sudden and intense desire to defecate. There is, of course, more or less loss of appetite, indigestion, and flatulence. The pulse and respiration may be slightly increased. The temperature is normal or subnormal in the morning and slightly elevated in the afternoon.

Grave cases with acute onset may terminate fatally within a week or ten days in spite of all care. The mild or moderately severe ones may continue for many months before alarming symptoms occur. The occurrence of complications may terminate in death or completely alter the course of the disease. Patients who do not recover under continuous treatment for six or eight months are likely either to die within a year or linger on as incurable.

The diarrhea is often intermittent—comes on abruptly and subsides abruptly. Between the attacks the stools may become formed. The intermissions may last several weeks or even months, or diarrhea may be absent during the entire course. Ulcers of the intestines can exist without any diarrhea, as is particularly likely when they are superficial and in the cecum or in the adjacent portion of the ascending colon.

The pain is very variable. It may be colicky and severe, localized over a particular ulcer, or over the abdomen generally. In chronic cases a dull aching pain, with occasional sharp exacerbations may be present. Loss of appetite is a common symptom and almost always present in acute cases. Hiccup is seen in various forms

shortly before death and when the peritoneum is involved. Fever is present in cases of acute onset.

The most common *complication* is abscess of the liver. Abscesses may be either multiple or single. They are found in from 11 to 33 per cent. of the cases. The most common seat of the abscess is the upper and posterior portion of the right lobe. An abscess is difficult to diagnose. There is often a dull aching pain, the variation of which is very great—being almost as frequent in the vicinity of the right scapula and shoulder as over the liver itself. Fever is usually present at some time, but is often not sufficient to attract attention. Chills and sweats may occur and the symptoms then simulate those of malaria. The blood usually shows a leukocytosis from 15,000 to 40,000, although the blood may be normal except for the anemia. Jaundice is rare, although the conjunctiva may show some yellowish tinges.

There may be also abscesses of the brain, of the spleen (rare), and of the lungs. Peritonitis may result from perforation of an abscess. Appendicitis occurs in about 7 per cent. of the cases. Intestinal hemorrhages are rather rare.

The *diagnosis* can be made only with the microscope after examining the warm, fresh stool. It is wise to give a dose of Rochelle salts and then examine the liquid mucus while it is still warm and look for the motile amebæ. It is wise, therefore, to have a warm bed-pan and to take the specimen at once to the laboratory.

The *treatment* may be illustrated by two outlines as devised for two important clinics of the United States. The general treatment is that given under the heading of "Nursing in the Various Dysenteries" at the end of the chapter (p. 180).

The first clinic outlines the treatment thus:

"This consists of three days' course of emetin hydrochlorid injected hypodermically, $\frac{2}{3}$ grain, twice daily for six doses. Also coal-oil irrigations of the bowel every other day.

"Or, more in detail:

"Three courses of emetin hydrochlorid are given, each course consisting of $\frac{2}{3}$ grain hypodermically morning and evening for three successive days, giving 4 grains in all. At the same time enemas of 1 quart of kerosene (common coal-oil) are given with the patient in the reversed position; that is, head and shoulders on the floor, body extending up the side of the bed, legs across the bed. The coal-oil is allowed to run in slowly, taking about five minutes. The patient then lies on the right side on the bed for half an hour, after which the coal-oil may be expelled at any time. The mucocutaneous surfaces must be well protected by vaselin, otherwise blistering will result. The coal-oil enema is preceded one hour by a cleansing enema of soap and water.

"The second course of emetin injections are given a week after the first, and the third course two weeks after the second. The coal-oil irrigations to be carried on every second day for three weeks, and after that once a week for three months."

The other consists of: Six days hypo. emetin 1 grain; twelve days, nightly, 3 pills bismuth, iodin and emetin, wrapped in beef suet; followed by teaspoonful of paregoric.

Three intravenous injections of neosalvarsan at four-day intervals.

Cholera

Asiatic cholera is to be distinguished from *cholera nostras* or *cholera morbus*, and, again, from *cholera infantum*. The two latter diseases are acute dysenteries, the former in adults, the latter in babies. They are really forms of enterocolitis, and are called cholera simply because of the similarity of the initial symptoms to those of the true cholera.

Cholera has its home in India. For example, 4,000,000 people died from cholera in India between 1902 and 1911.

Thence it is transported to the Occident along the caravan routes by pilgrims and the ordinary intercourse of commerce. It was epidemic in the United States nine times during the nineteenth century.

Asiatic cholera is caused by a bacillus called, because of its peculiar shape, the comma bacillus or vibrio.

Incubation Period.—The incubation period is short, frequently one to two days, rarely over five. The period of quarantine is five days.

Transmission.—The disease is spread both by direct contact and by food, and especially by drinking-water. There are also many carriers. For example, the infection may be spread by flies, for the vibrios may live for three days in the intestines of flies. The cholera vibrios are passed in enormous quantities in the feces of the patients during the early part of the disease. They usually disappear from the feces after the fourth to the fourteenth day, but may sometimes be present for a month or two.

The disease is not very contagious. Apparently infection takes place through the digestive tract. Hence, epidemics usually spread by means of the water-supply. The doctors and nurses attending cholera cases are not often infected, but the washerwoman and those handling the linen from such patients frequently suffer.

After an incubation period of three to five days a diarrhea sets in with colicky pains in the abdomen. There are headache and nervous depression, but only rarely fever. As the diarrhea increases in severity the stage of collapse is introduced. The temperature may be subnormal in the mouth or under the arm, but still show 103° or 104° F. on a thermometer inserted into the rectum. The loss of water causes the skin, especially that of the face, to become ashen, the eyes sunken, and the cheeks hollow. The stools now have the appearance of rice-water, due to the presence of flakes of mucus, serous matter, and even blood. The patient can still secrete perspiration, but the

urine and saliva are checked by the lack of fluidity in the blood. Patients may, however, die before this purging begins. The preliminary diarrhea lasts for one or two days, the collapse stage from two to twenty-four hours; then, if all goes well, the reaction leading to convalescence sets in.

Convalescence may be rendered difficult by the occurrence of local complications, such as diphtheric colitis and parotitis. Even pneumonia and pleurisy may appear.

The case mortality varies from 30 to 80 per cent. The previous condition of the patient's health and environment largely determine the result.

Treatment.—The treatment must be prompt if it is to be effective. During the preliminary diarrhea full doses of morphin may be introduced hypodermically. The nurse should irrigate the bowel (using the long colon-tube and forcing the fluid past the iliocecal valve, if possible) with 3 to 4 liters of a normal salt solution or 2 liters of a 2 per cent. tannic acid solution at 110° F. This may be repeated as often as the patient's strength permits. In the collapse stage normal salt solution should be introduced subcutaneously (or intravenously). This should be kept up as long as it is absorbed. Of course, such a solution must be sterile and given under aseptic conditions. When possible the intravenous method should be adopted and 2 quarts introduced within fifteen to thirty minutes. It should be repeated in six to eight hours.

The disease is hardly more infective than typhoid, hence under careful supervision it ought not to spread. The important requirement is to have all food and drink sterile during the presence of an epidemic. The usual rule is to take only "hot food and drink."

In the presence of an epidemic, or if one is about to visit a cholera-infected country, it is well to be vaccinated against cholera, even if this vaccination does not give as

complete a protection as does that against smallpox or typhoid fever.

Trichomoniasis

Trichomoniasis may be defined as an infestation of the intestines, less frequently of the stomach, mouth, air-passages, vagina, and other organs by species of the genus Trichomonas characterized by no definite symptoms or by those due to local irritation.

Etiology.—Trichomonas are considered usually as strict parasites of man and other animals with an encysted stage during which they are transferred directly or indirectly from one host to another. They usually enter directly into the digestive tract, but may be found in the respiratory passages, the vaginal and urinary canals, and elsewhere.

Intestinal Trichomoniasis.—By stool examination the percentage of infection varies between 10 and 75 or more of the inhabitants in different tropical localities. The number of persons harboring parasites who show diarrhea or other symptoms which may reasonably be charged to the infestation varies from 10 to 50 per cent. of all classes, and is much higher among those heavily infected.

Symptoms.—The symptoms of intestinal infection are usually diarrhea, not severe, worse in the morning, and accompanied by flatulence and more or less indigestion. There may be moderate secondary anemia and usually there are nervous symptoms, such as irritability, insomnia, and headache. Not infrequently trichomonas occurs in the stomach as well as in the intestines and is usually associated with similar symptoms.

Treatment.—The treatment is similar to that given below for lambliasis.

Sprue

Of late years we hear often the word "sprue," especially from the missionaries in China and Korea, and from the travelers who visit the West Indies. But the disease is

so illy defined that it cannot be classified satisfactorily even yet. It belongs to one of those indefinite malnutritioned disorders, such as pellagra and hookworm disease. Ashford thinks that it is caused by a sort of low-grade organism called monilia psilosis.

At any rate, when the inhabitants of the tropics use the word *sprue*, they usually refer to a colonic condition of the diarrheal type. The stools are large, acid, light in color, and very fatty. But there is little pain. The stools come usually between midnight and noon. Another characteristic is a sore tongue. The blood becomes anemic very soon, and may resemble pernicious anemia in type.

There is a tendency for the disease to become chronic or really to become converted into a chronic diarrhea. Occasionally a death is reported as being due to it, but thus far good postmortem examinations have not been obtained.

The diet given usually is raw strawberries and milk. Another dietary consists of finely chopped meat or beef cooked very lightly and given with much water. At any rate rest in bed is essential.

Dysentery Due to Flagellate Protozoa

Flagellate protozoa belonging to the classes tetramita, chilomastixia, cercomona, prowazeki are found inhabiting chiefly the intestines and occasionally other parts of the human body. Their distribution is wide-spread as parasites of man, several lower animals, and invertebrates. Their association with diarrhea and other disease symptoms in man is quite universal. But as in the case of giardia and trichomonas the highest incidence of infestation and the most frequent association with symptoms are found in the tropics.

Transmission.—Transmission usually occurs through faulty personal hygiene or indirectly by infected food and water, or by flies, or perhaps even by the winds which may carry the spores.

Pathogenicity.—The pathogenicity is still under discussion. (Musgrave, Journal of American Medical Association, vol. 79, No. 27, p. 2219.)

Lambliasis or Giardiasis

This is an infection or infestation, principally of the intestines by Lamblia intestinalis discovered by Blanchart in 1888, characterized by chronic diarrhea, with intermittent acute exacerbations, digestive disturbances and nervous symptoms, or by the presence of the parasites without symptoms. Lamblia intestinalis is one of the common parasites and lambliasis is one of the common diseases of the tropics.

Predisposing Causes.—The chief predisposing cause is a tropical climate and summer weather, such as in the warmer parts of the Temperate Zone. Children are especially susceptible and the infection is more severe in them than it is in adults. In the tropics the infection is relatively higher and more severe among foreigners than among the native races.

The exciting cause is, of course, the Lamblia intestinalis. It is generally considered that the parasites have no free living cycle. Its transmission, therefore, must be directly or indirectly from one host to another. There is ample evidence that such are the methods of transmission to the human host. The direct method from infective excretion to the mouth probably is important, particularly in children. Others, however, believe that the common house fly is the most important method of transmission. It is generally recognized and has been experimentally demonstrated in some cases that water, vegetables, cereals, and other foods may be contaminated with spores or infected forms from the discharges of infected persons or animals, and that new infections occur through eating such infected substances. It has been suggested that spores may be transmitted through the air in dust, as is

known in the cases of certain other parasites. The occasional infestation of the respiratory tract appears to strengthen this view as to a possibly practical method of transmission. In the vast majority of cases invasion is through the mouth. But the occasional finding of the cysts in bronchiectatic secretions suggest possibilities of entrance through the respiratory system.

Pathology.—In their flagellate stage the parasites are probably limited to the small intestine. Except in cases of diarrhea active forms are rarely seen in the feces.

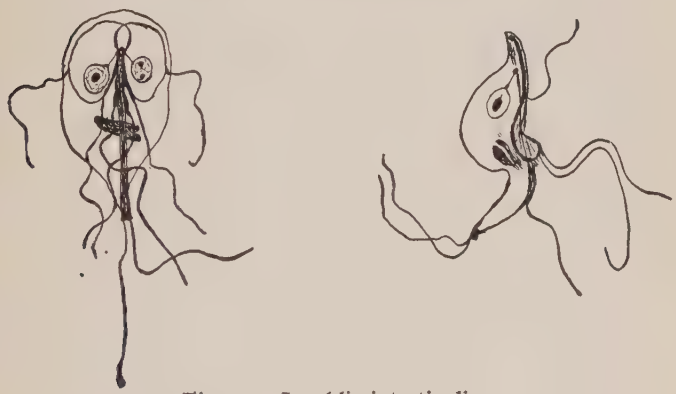

Fig. 32.—Lamblia intestinalis.

Encysted forms are more or less constantly present in the formed stools when the small intestine is infected. That the cysts may reach more distant organs is shown by their presence in the contents of liver abscesses.

Symptoms.—The usual symptoms of intestinal infection are a chronic diarrhea with exacerbations and intermissions. There may be constipation very much as is seen in amebic colitis. There is nothing distinctive about the diarrhea except its persistence, and the difficulty in obtaining a permanent cure particularly in children. The

stools are of the usual type, and in severe cases there may be some tenesmus and blood, but this is exceptional. Microscopically, there is mucus, usually blood-cells, and either motile or encysted lamblia. The parasites are usually quite numerous when the diarrhea is severe, but during intermissions only a few or no cysts may be found after prolonged search.

Diagnosis.—The diagnosis is made by the study of the stools, and repeated examinations are necessary before a case may be pronounced free from infestation.

Prophylaxis.—Public health measures consist in the proper disposal of feces and in the destruction of flies, rats, mice, and other animals known to harbor the parasites. Personal measures consist in using safe drinking-water, avoiding uncooked food, and maintaining scrupulous cleanliness about the discharges, particularly where there are children.

Treatment.—There are no known specific remedies. Various drugs, such as turpentine, ipecac, emetin, quinin, methylene-blue, arsphenamin, arsenic, and thymol, have been used intravenously, internally, or by enema. Enemas are useful when there is diarrhea, and for this purpose a 1 : 2000 preparation of thymol has given great satisfaction. Of all internal remedies, thymol in 0.25- to 0.5-gram doses given in capsules with lactose has given the best results.

Nursing in the Various Forms of Dysentery.—Meara gives such a good detailed outline of the measures required in the care of dysentery that it has been thought worth while to incorporate it here.

Rest.—One might assume that the train of events in dysentery would compel rest, and so, indeed, in severe cases it does, but in the cases that in their incipiency promise to run a mild course it is often difficult to get the patient to bed; and his failure to accede to such advice may determine a very severe process in what might have been relatively benign.

Rest in every case is desired both for the body at large, suffering from the effects of the toxins of disease and of pyrexia, to shelter metabolism by avoiding unnecessary work and so diminishing the demand for food to meet such metabolic needs and sparing the organs concerned in digestion, assimilation, and utilization of these foods, but also for the particular organs or tissues that chance to be the sites of lesions caused by the disease; in this case, the large intestine. Now, the large intestine is a receptacle for certain materials, in part passed on from above, in part excreted from its walls. In this material fermentative and putrefactive processes are going on as the result of bacterial action. From this material water and certain substances in solution are being absorbed. This structure, the bowel, is in a condition of active muscular exercise, the site of peristalsis, of a swinging pendulum movement, and finally is pressed upon and massaged by contiguous structures as the result of the action of the muscles surrounding the abdominal cavity, from which arises the great benefit in constipation from walking and gymnastics directed to the abdominal muscles. By putting the patient to bed we avoid the squeezing and massaging due to muscular action, and so take away one stimulus to increased peristalsis, an important factor, considering the hyperacidity of this function, upon which the frequency of the movements and the colicky pain so largely depends.

Even the bed is a bed of unrest, for the griping pain is always forcing the patient to seek some position to relieve it.

Bed.—Far more work is to be done about this bed by nurse or attendant than about the bed of even a typhoid fever patient. The constant use of the bed-pan, the soiling that necessitates changing of the bed-linen, the soothing applications to be made, the irrigations to be given, all demand as much economy of effort as can be

procured by favoring conditions of work. The bed, then, should be chosen with care. It must be a narrow or half-bed, best of the hospital type, which is about 6 feet, 6 inches long, 36 inches wide, and 24 to 26 inches high. The spring of woven wire must be stiff and the mattress of hair preferably firm. Over this place the sheet, long enough to tuck well under and draw smooth and taut. If the surface of the mattress is not smooth a folded blanket under the sheet will make it so.

Over the sheet is put a rubber sheeting that should extend from the pillow to the bend of the patient's knees and wide enough to tuck under. Over this comes the important draw-sheet, a long sheet folded lengthwise and laid across the bed, covering the rubber sheeting and tucked far under one side. This sheet can be drawn toward the other side, little by little, to afford a cool fresh surface under the patient from time to time, or if soiled, can be replaced without remaking the whole bed. Over the patient is placed the upper sheet and one or two blankets, arranged with a view to comfort.

It is very well to have a second bed of the same kind, on to which a patient can be drawn while the mattress and clothes of the first are airing.

Room.—Every sick room should be large, well ventilated, and should get sunshine. As, however, the disease is far more common in the summer than at any other time of the year, it is well to select a room in which there shall be shade the most of the day. Morning sun and afternoon shade are, of course, ideal. If there is a balcony on which the patient can be wheeled, it will, if it is properly screened, serve as the best possible place in the warm season.

A bath-room contiguous to the sick room is extremely desirable, saving much labor of fetching and carrying, as is obvious.

The odors, which in some cases are very offensive to the

patient as well as to attendants, may be mitigated by good ventilation, by one of the many deodorants on the market (whose claim to disinfect the community when a few drops are shaken here and there must not be taken seriously), by the burning of joss-sticks, etc.

Care of the Body.—A cleansing bath should be given each day if there is a skilled hand to administer it or the manipulation does not cause too much exhaustion.

It is given between blankets with the patient divested of his night-shirt, being rolled on one and covered by another. Soap and warm water at 110° F. is used, one part of the body after the other being exposed and attended to and then dried.

The feet may be placed in a small foot-tub in the bed, the knees being drawn up. After the bath the skin may be rubbed with alcohol and dusted with drying powder —one of the numerous talcum or toilet powders in use.

An approximation to this detail can be attained by an attendant in the family, if care is exercised.

The *mouth* should be attended to by rinsing after every feeding; and, if in bad shape, carefully cleansed by gauze or absorbent cotton around the finger of the nurse or on some applicator after dipping into some cleansing solution, like the so-called alkaline antiseptic solution. If very bad, peroxid of hydrogen diluted one-half with water, or salt solution, may be used before the mouth-wash.

When the mouth is very dry equal parts of albolene and 2 per cent. boric acid solution with a little lemon juice gives relief. Glycerin is sometimes used, but if the mouth is very dry it may be aggravated by the glycerin because this takes up water so readily.

Constancy of attention and patience are needed to nurse these cases properly, because the restless patient is disarranging the clothes and seeking a comfortable position every moment. The knees are often drawn up

to lessen the tension of the abdominal muscles, a hard position to maintain, as the feet slip on the smooth sheet. A folded blanket or pillow under the knees gives comfort.

Rings and air-cushions may be needed to take the pressure off the bony parts as they become more sensitive.

Nothing is more striking and real than the intangible something we call the "atmosphere" of the room, and it is the ability of the trained hand to secure order, neatness, quiet, and calm that gives courage both to the patient and the doctor.

Frequent visitors, garrulous friends, Job's comforters, peddlers of similar experience, *et id genus omne*, are to be excluded as a part of the treatment.

The *bed-pan* in this disease is the most important article in our armamentarium, and its skilled use is imperative. The distressing condition that obtains in some of these cases is hard to appreciate unless witnessed. I have seen stools coming every fifteen minutes with tenesmus that deprived the patient of all sense of relief after the stool, and keeping up for hours, until the patient begged that the pan be not removed at all.

The pan should be warmed before using, the patient's knees flexed, and a hand placed under the lower part of the back to raise him. The same thing is done on taking the pan away. Either a clean pan can then be slipped under the patient or a towel may be placed under the pan to begin with, upon one or the other of which the patient lies while the parts are carefully cleansed, dried, rubbed with alcohol, and dusted.

It is very essential in this disease that the patient's body and abdomen should be kept warm, as chilling aggravates the diarrhea. Woolen material should be worn over the abdomen. If the feet are cold the hot-water bottle is to be used.

Diet.—During the first few days of the attack, when the stomach is often very sensitive to food, and nausea and vomiting are a feature, and while the evidence of

intoxication is most marked and peristalsis most active, the quantity of food is of less importance than the quality.

The food must be bland, non-irritating, and non-stimulating to the gastro-intestinal tract, must be readily assimilable and leave but little residue, and must be concentrated, especially with reference to its protein content. All these conditions are met by milk better than by any other food.

Relief of Pain.—Between the constantly recurring griping, twisting, colicky pains and the incessant nagging of the tenesmus, exhaustion threatens, so that the symptom is one of the most urgent in its demands for relief.

This may be afforded by topical applications or drug administration.

Heat to the abdomen is one of the best measures we have at out command. It can be applied in the shape of hot fomentations, turpentine stupes, or thin poultices.

To give a fomentation take two pieces of thick flannel; an old blanket affords just the material we want, cut into squares to cover the abdomen.

Have ready, in addition, another piece of flannel for a cover or protector, and a towel with sticks sewed across either end to answer as a wringer.

Lay the flannel squares in the towel, pour boiling water over them, saturating them thoroughly, and then quickly wring out in the towel by twisting the sticks in opposite directions to each other. The wringing must be complete and no water be left in the flannel. Take this out quickly, shake it once in the air, place it on the abdomen, and cover with the protector. Before the fomentations are applied the skin may be well lubricated with vaselin.

It is helpful to have the patient in a blanket which can be brought up over the fomentations.

These may be applied every ten or fifteen minutes until relief is afforded.

Turpentine stupes are prepared in much the same way, a dram of turpentine having been added to the hot water

into which the flannels are to be dipped, or the stupes may be sprinkled with a little turpentine after they have been wrung out, or a bit of absorbent cotton wet with turpentine may be passed lightly over the abdomen before the stupes are applied. Careless application of the turpentine may result in a burning of the skin. The frequency of application and the length of time they are to be left on will depend on the reaction of the skin to the turpentine and the efficacy of the measure. These devices not only lessen the spasm, but by so doing diminish the frequency of the stools. Comfort may also be afforded by warm rectal irrigations, at 100° to 105° F., of plain water or, better, physiologic salt solution (1 teaspoonful —1 dram—of salt to the pint).

There is one thing about the irrigation and the use of all topical measures to be insisted upon, and that is, if used in the acute stage assiduously the chronicity of the process may be due to the irritation these very measures keep up, and a cessation of all local treatment be followed by rapid improvement. Again, when these methods are pursued in a chronic case, improvement may be seen up to a certain point and then cease or the condition grow worse. The treatment should be stopped and the effect studied.

The irrigation is to be done with the patient in the dorsal position with the hips elevated and on a douche-pan, or lying across the bed on a rubber sheet so arranged as to form a gutter for the discharge of water. Sometimes the bowel is better filled by putting the patient on his left side and then turning him to the right, so as to seek the assistance of gravity in following the line of the colon. If the patient is fairly strong, the more trying knee-chest or elbow position may be used. The tube should be long and soft—a colon-tube, a stomach-siphon, or a large rubber catheter will answer. The tube is warmed, lubricated, and passed carefully into the bowel, as any roughness will cause a contraction and defeat the purpose.

If it meets with an obstruction, wait until a spasm ceases and then try again. If difficulty is met with, let a little water pass in to distend the gut and try again. Pass it in 18 inches or more.

The tube is then or has previously been attached to a Y-tube, to the other two limbs of which are attached the fountain-syringe and the drainage-tube. The bag contains for a simple irrigation plain water or, better, a physiologic salt solution (a level teaspoonful of salt to the pint), at a temperature of 100° F. It should be held about 3 feet above the level of the patient's body. The water is allowed to flow in and out by alternately pinching the out-flow tube and the in-flow tube. Discomfort on the part of the patient tells when enough has been introduced at any one time. If the irrigation of the lower part of the intestine alone is aimed at, a two-way tube like the Kemp is a great convenience. About 2 quarts may be used at a time; in some cases, even more.

The irritation of the rectum and anus should be quieted by applying freely cold cream, menthol ointments, or vaselin. This may be done with the finger, with the "pile-pipe," or by inserting suppositories.

CHAPTER XIII

YELLOW FEVER DENGUE—RELAPSING FEVER—TRENCH FEVER—MALTA FEVER

Yellow Fever

There are good reasons for believing that yellow fever was the chief cause of the overthrow of the great civilizations of Central America, the extent of which is today known only from the ruins left. The extermination of this disease from this region seems now very near at hand. Indeed, experts in the epidemiology of yellow fever point to the fact that while less than fifty years ago this disease made frequent excursions to the United States and occasionally into Canada and Europe and Africa, it is now confined to isolated localities in southern Mexico, a few villages in Brazil, and possibly it may be in concealment in the dark corners along the western coast of Africa.

This disease has made communication with the cities and countries south of us dreaded and dangerous. It is an epidemic disease in the United States, the last epidemic being in New Orleans in 1905. The disease has been endemic in Central America and the West Indies, but American sanitation has succeeded in rendering it sporadic wherever the United States Government has secured control. Its range may be said to lie between 45 degrees north and 35 degrees south latitude (Guiteras).

The cause of yellow fever was established by a commission of officers from the Medical Corps of the U. S. Army composed of Walter Reed, James Carrol, J. W. Lazear, and A. Agramonte, who conducted a series of

experiments in Cuba in 1900 that proved beyond the shadow of a doubt that the disease was conveyed by the mosquito.

Our earliest authentic accounts of this disease recorded is the occurrence of the disease in the West Indies in the middle of the seventeenth century. Its mortality in the early days is illustrated by the account of Dr. O'Halloran, who studied the epidemic in Barcelona in 1821, where the general hospital was caring for 930 patients suffering from yellow fever. And of these no less than 729, or 90 per cent., died.

Yellow fever is transmitted by the mosquito called the Stegomyia (more lately termed Aëdes ægypti), and all attempts to bring about infections through contact with bedding, clothing, and the dejecta of yellow fever patients have resulted in failure. Hence, it follows that fumigation as a protection against yellow fever is valueless.

The specific germ of yellow fever is sufficiently minute to pass through the pores of a bacteria-proof filter and it is destroyed by a temperature of 131° F.

The yellow fever mosquito (the Aëdes ægypti, or Stegomyia fasciata, or Calopus) may pass a screen of sixteen strands or fifteen meshes to the inch, but cannot pass a twenty strand or nineteen meshes to the inch. The Aëdes ægypti is a grayish mosquito of average size with beautiful glistening silver white markings. These markings are lyre shaped on the back of the thorax. Silver-white spots are seen on the side of the thorax. White lines are apparent on the tarsal joints and also on the palpi. The scutellum is white. In the female the palpi are much shorter than the proboscis, which at once distinguishes it from the Anopheles.

Incubation Period.—After a mosquito bites a patient with yellow fever it takes the organism twelve days to develop into the form in which it grows inside the human

body. So during this interval the bite of that particular mosquito is innocuous. After the twelve days it may carry the disease. This will manifest itself three or four days later. Thus from the time when a mosquito sucks up the blood of a yellow fever patient to the time when the disease breaks out in the next victim at least fifteen days must elapse. But from the time when an infected mosquito bites a person to the time when the fever breaks out only three or four days intervene.

Onset and Course.—The disease begins with headache and general pains, and a rapidly rising fever. The tongue becomes coated and the throat sore, the bowels constipated; and gastric symptoms (vomiting and retching) become very troublesome on the second or third day. The eyes and face are flushed at the very beginning and show a gradually deepening jaundice, which gives the disease its name. The fever continues for three or four days, and is followed by a period of remission ("calm") lasting one or two days. This, in turn, is followed by a secondary fever, which may end after another period of two or three days by a short lysis. The pulse is peculiar in that it may begin with a rate of 100 to 110, and with an increasing temperature gradually lower the rate so that at the end of the fever the rate may be only 50, or even as low as 30. From the third day on albumin is found in the urine. The nephritis thereby indicated may be so severe that anuria with uremic coma may supervene, producing, of course, death. While delirium is frequent, still the mind of the patient is generally unusually clear and alert. The vomited matter soon becomes bloody, and because of its color has given the disease the name "black vomit."

The mortality ranges from 15 to 85 per cent. It is lower among negroes than among whites. It is greater among alcoholics than teetotallers. The surroundings and strength of the patients have much to do with the outcome. Immunity is not always gained by one attack.

Treatment.—The first thing to be done, therefore, in the treatment of a patient ill with yellow fever is to isolate him and screen him so thoroughly that no mosquito can bite him. The fever is treated with cold baths—as typhoid. The constipation is relieved at the outset with a good purge. The gastric hemorrhage is treated with the solution of perchlorid of iron or similar astringent. Digitalis and similar drugs are used to keep the heart and kidneys active. The value of quinin is disputed. The vomiting is probably best relieved by ice given in small pieces. Food can be given by the mouth only when there is no vomiting. In general, nutrient enemata are demanded throughout the disorder.

Dengue (Den'ga)

This disease is also known as breakbone fever or dandy fever. It is characterized by agonizing pains, high fever, and an eruption sometimes macular, sometimes diffuse.

After an incubation period of from three to five days the fever begins, with headache, pains in back and joints, and a rapid pulse. The temperature may reach (in a gradual ascent) 106° to 107° F. The skin becomes congested and reddened with a varied eruption. The mucous membranes are also congested and may bleed. After three or four days of fever the temperature falls and remains normal for from two to five days, when the second paroxysm occurs, similar to the first, but usually shorter. This may end the attack or a second remission and third fever stage may appear. During the disease there is more or less swelling of the lymph-glands and of the joints.

Very few deaths are caused by the disease. Its causative organism is unknown. But it is transmitted by the mosquito, and that the Stegomyia (Aëdes ægypti). It must be distinguished from acute rheumatism, influenza, and yellow fever.

The **treatment** is chiefly that of quieting the pains. Therefore, cool sponging, the ice-bag, and the use of morphin hypodermically will be called for. During convalescence careful attention to the joints and glands will be required, and massage and tonics utilized.

Relapsing Fever

Relapsing fever, also called famine fever, tick fever, and seven-day fever, is found upon all the five continents

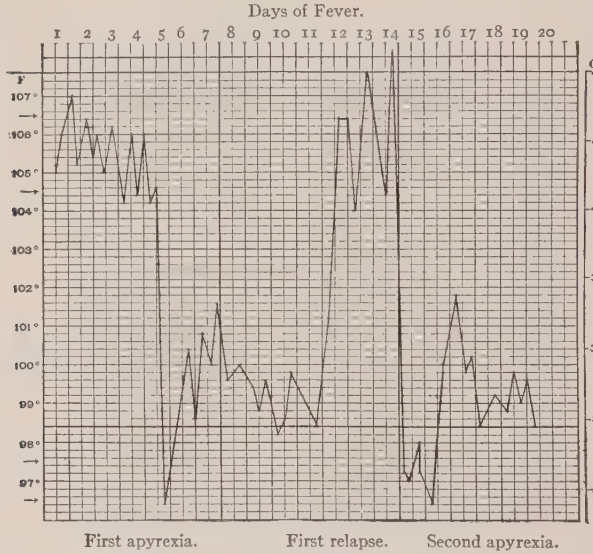

Fig. 33.—Temperature chart of relapsing fever (Wunderlich).

of the globe. Epidemics from this disease have been reported, especially from Ireland and Russia. The infection prevails in India, where Vandyke Carter, of Bombay, made his classic investigations. Relapsing fever was epidemic in New York and Philadelphia in 1869. It has not reappeared in epidemic form, but cases occur

occasionally in various parts of the United States. The disease has receded before civilization where sanitation is practised and hygiene is observed.

The term "relapsing fever" includes a group of tropical febrile infections caused by several different but closely allied spirochetes, Spiroschaudinniæ. The European relapsing fever is caused by S. recurrentis and transmitted by bedbugs and lice. The relapsing fevers of east and west Africa are caused by S. duttoni and transmitted by the ticks. North African or Algerian relapsing fevers are caused by the S. berbera and are transmitted by lice. The relapsing fevers of Asia are caused by the S. carteri and are transmitted by lice. These various spirochetes resemble each other pathologically, but show a difference in pathogenicity to laboratory animals, and are further distinguished from each other by specific agglutinins.

Relapsing fever is characterized by a sudden onset, intense pains in the back and limbs. The fever continues from three to five days and falls by crisis. The temperature remains normal for about a week, when the fever repeats itself. There may be four or five such relapses, sometimes ten. The spirochetes are found in the peripheral blood only during the febrile period.

Treatment.—The best treatment is probably by the use of the arsphenamin and neo-arsphenamin injected as one would in syphilis.

Prophylaxis.—Public prophylaxis demands that vermin, such as lice, etc., be exterminated, that individuals be kept, as far as possible, free from them. In other words, the jails, hospitals, almshouses, etc., should be investigated by public health authorities on this score and kept clean for this reason, if for no other.

Trench Fever

Trench fever was one of the new disease entities to arise from the late Great War. So new is it and so con-

fusing the reports on it that, as yet, no settled or satisfactory description of the disease may be given.

In general, it may be said that it has a sharp febrile attack, sometimes recurrent, severe headaches, dizziness, and a relatively slow pulse. There is sweating and polyuria and occasionally a moderate leukocytosis at the height of the fever. Between the attacks there is a leukopenia.

It is never fatal and a complete recovery usually takes place. However, a certain percentage of the patients may pass into a stage of chronic ill health, wherein they suffer recurrent pains in the limbs, and nervous manifestations, such as mental depression and an excessive tendency to sweating, disordered action of the heart, a mild degree of anemia, and some loss of weight.

The disease is transmitted by the louse. The probabilities are that the soldiers who were covered with lice would carry the virus into the scratch-marks of the skin when they tried to relieve their desperate itching by scratching. The virus is so minute that it passes through an ordinary filter, but it has been identified and named as the Rickettsia pediculi.

Prophylaxis naturally demands cleanliness and freedom from vermin. Where this cannot be obtained, then the use of antiseptic and soothing lotions should be provided. Many different sorts would do. Therefore, the whole matter is one as to how practical (or possible) it is to supply the soldiers (or workers in trenches) either with plenty of soap and water, or with oils and greases.

When the disease is once under full headway the soldiers should be removed to places where they can be cleaned up and allowed to rest. And usually there is complete recovery in a few days.

Malta Fever

This disease is found chiefly along the shores of the Mediterranean, but also in Porto Rico and Manila. The

disease is transmitted by the goats of these countries through the milk. The occurrence of the disease has been greatly reduced by either prohibiting the use of goat's milk or by sterilizing it.

The period of incubation is about fourteen days. The fever is of the intermittent or undulating type—rising and falling without much regularity or rhythm during a period varying from one week to six months. There are neuralgic pains, swellings of the joints, constipation, and a progressive anemia accompanying the disease.

The disease, therefore, is apt to be confused with tuberculosis, pyemia, typhoid fever, and similar disorders. The blood-tests (agglutination of the causative organism with dilute serum from the patient's blood) and the finding of the organism in the blood, the *Micrococcus melitensis*, must be relied upon for the diagnosis.

It may last from two weeks to two years, the average duration being three months. The mortality is but 2 to 3 per cent.

The treatment, as far as the nurse is concerned, is that of typhoid fever.

CHAPTER XIV

ANTERIOR POLIOMYELITIS—CEREBROSPINAL FEVER—EPIDEMIC ENCEPHALITIS

Anterior Poliomyelitis

This is called the Heine-Médin disease in French literature because Heine first described it (in 1840) and Médin studied it more thoroughly (in 1880). It is also called cerebrospinal paralysis of children and "infantile paralysis." It is pre-eminently a nervous disease of childhood. In this disorder the cells in the anterior horns of the spinal cord are attacked, with the result that the nerves dependent upon them for nutrition degenerate. The attack may come on in apparently perfect health, and is notably frequent in children under three years of age; or, the attack may be accompanied by fever and other symptoms of an acute disorder. But there are few objective symptoms until pain and tenderness appear in the muscles (of the leg usually) supplied by the affected nerves. Then comes the flaccid paralysis, the limbs lying limp and useless. Sensation in the parts affected remains normal. Soon comes atrophy, and the shrinking of the arm or leg, as the case may be. The groups of muscles most often affected are the peroneal and tibial. Complete recovery from this paralysis is rare, although death rarely results from the attack.

It seems to be an infectious disease in which the virus is transmitted by flies or insects. Strict isolation is therefore necessary whenever a case is found.

In 1920 in the registration area of the United States acute anterior poliomyelitis caused 769 deaths—that is, a death-rate of 0.9 per 100,000. The highest death-rate

since 1910 was in 1916, when it was 10.6. The rate in the rural districts and cities is the same. There is apparently little change since 1920, for in 1921 the deaths numbered 1597, that is, a rate of 1.8; in 1922 there were 790 deaths, a rate of 0.8; in 1923, 850 deaths, a rate of 0.9.

Age.—In general, it is a disease of childhood between the ages of two and five.

Sex.—The male is more often affected than the female. The social condition seems to have no influence. The rich are attacked as often as the poor.

Seasons.—If there is any difference at all, it is that more cases occur in the summer than at any other time.

Communicability.—The disease has been transmitted experimentally to monkeys and from monkey to monkey. We find the virus in the mucus of the nose, the tonsils, and the salivary glands. It is transmitted, therefore, directly from patient to patient by contact. But it is also transmitted by carriers who may themselves be healthy. Wickman has shown that the virus may be carried by inert objects. House and other flies have transported the infection.

Immunity.—Animals which have had the disease are immune to further infection. Similarly among human beings there is a slight immunity.

Pathologic Anatomy.—The seat of the disease seems to be in the cerebrospinal axis. The real lesion is in the anterior horns of the cord at the level of the bulb and medulla. The meninges are vascularized. The tissue of the cord seems slightly congested and the consistence is a little soft. Under the microscope one finds a hemorrhagic congestion of the subarachnoid space. After the acute disease has passed there develops an atrophy of the medullar tissue corresponding to the paralyzed muscles. This atrophy proceeds hand in hand with the production of a definite cicatricial sclerosis. Often the cerebral hemisphere of the opposite side is slightly atrophic, the anterior roots of the nerve corresponding to the cicatricial point are grayer than in the normal state. At the level

of the foci of sclerosis, the microscope shows the entire disappearance of the cells and the root fibers. One observes only somewhat hyperplastic neuroglial tissue of which the fibers are interwoven in every sense, containing sometimes calcium deposits and amyloid bodies. The blood-vessels present the lesions of chronic endarteritis.

Symptomatology.—After a period of incubation which varies from one to twenty days, but which can be averaged as between one and four days, the disease begins with a sharp elevation of temperature which may reach 105° F. There may be a coryza or a red throat. At the same time the patient shows gastro-intestinal disturbances. Vomiting is frequent. There is sometimes a fetid diarrhea leading one to think of infantile gastro-enteritis. Then the child becomes somnolent, prostrated, indifferent, or, on the other hand, may show agitation, insomnia, or even delirium. The headache is constant, but less marked by cries and complaints than in meningitis. Sometimes there is incontinence of urine and sometimes retention. Lumbar puncture brings out clear and limpid spinal fluid often without tension. The laboratory examination of the fluid shows a lymphocytosis with an increase in the amount of albumin. The blood shows a leukopenia sometimes as low as 3000.

As soon as the fever begins to fall the paralysis appears —sometimes twenty-four hours after the beginning of the disease, at other times as late as ten or fifteen days. Paralysis rarely begins everywhere at once. The paralytic trouble attacks by preference the lower limbs under the form of a monoplegia or a paraplegia. Rarely are all the muscles attacked equally severely. Ordinarily the reflexes are abolished. The atrophy of the muscles begins to be apparent in the second month.

There may be several clinical forms varying according to the different nervous structures attacked, such as the bulboprotuberantic, the cerebral, the atactic, the painful, the variety called the "ascending paralysis of Landry," and the meningeal forms.

Treatment.—Because many of the nerve-cells are not destroyed but simply injured, there is a good opportunity for treatment in this disease.

During the height of the disorder warm baths are used in order to quiet the patient. The water should run about 100°, or from 95° to 100° F. Calomel is used for the intestinal condition, aspirin for the pain. Sometimes hexamethylenamin is given in order to combat the infection in the spinal canal. Then electricity and careful massage are used to keep the muscles that have been deprived of their nerve connection in good order. This massage and electric treatment must be very carefully done, and yet it must be done early, because if more than twelve months elapse there is little use of treatment.

The deformities resulting from the wasting away of the muscles can be helped by the orthopedic surgeons, who transplant the tendons of good muscles over to the parts that are deprived of muscular activity.

Cerebrospinal Fever

Epidemic cerebrospinal fever, or epidemic meningitis, or cerebrospinal fever, or "spotted fever," or petechial fever all refer to one disease which is caused by the Diplococcus intracellularis discovered by Weichselbaum in 1887.

It must be sharply differentiated from the ordinary forms of meningitis, also from anterior poliomyelitis, infantile paralysis, and from encephalitis lethargica, and similar disorders.

In 1920 the death-rate was 3.1; in 1921, 1.5; in 1922, 1.0, and in 1923, 1.1. In the cities it was 3.5, and in the rural districts 2.8. The case mortality varies from 25 to 75 per cent. When serum is available for treatment, the lower case rate is to be expected—namely, about 25 per cent.

It is essentially a disease of childhood, the usual ages varying from infancy to seven years of age. But during war times it is very prevalent among the troops, and

certain regiments or barracks become so infected that the disease is present nearly all the time.

Transmission.—It is transmitted by contact and by carriers. That is, many healthy people carry the bacteria which cause this disease about in their noses and throats. Apparently the virus penetrates through the cribriform plate in the top of the postnasal space into the brain.

Incubation Period.—The incubation period is about three days. (But it may vary from thirty-six hours to a month.)

Diagnosis.—The diagnosis is made by examining the spinal fluid and finding minute, intracellular organisms (a diplococcus found inside the cells of the nervous tissue).

Symptoms.—The onset is attended with chills, vomiting, headache, backache, and a painful rigidity of the neck and back. The fever varies from 101° to 105° F. The child starts at slight sounds and shows signs of pain at ordinary noises. The head is drawn back and sometimes the back is arched. There are usually convulsions followed by stupor and coma. There are albumin and sugar (and sometimes blood) in the urine. The respiration is not greatly affected, but the pulse is slowed. Eruptions, either herpetic or purpuric, occur in most cases. Naturally, there is constipation. The pathologist finds an increase in the number of white blood-cells. An interesting symptom (common to most forms of meningitis) is that called Kernig's sign: flex the thigh at right angles to the abdomen, then the leg upon the thigh; if meningitis be present, extension of the leg is then prevented by a contraction of the flexor muscles.

Prognosis.—The prognosis is bad, ranging up toward 80 per cent. of deaths. Those that recover bear with them for life the marks of the disease, except when the attack has been exceptionally light.

Treatment.—The treatment is chiefly symptomatic, except when it is possible to inject an antimeningococcic serum into the spinal canal early in the attack. Cold

packs and ice-bags are applied to the head and spine. Very little feeding by the mouth can be attempted. The nurse's chief effort should be to protect the patient from light and noise, and to stimulate the vital organs by hydrotherapeutic treatment and the hypodermic use of appropriate drugs until the force of the attack be spent.

Encephalitis Lethargica

Although this is the last of the communicable diseases to be recognized and set aside as an entity, yet it is probably a disease of considerable antiquity. It was described as a definite entity by Economo in connection with an epidemic at Vienna in the spring of 1917. It spread, however, during 1918 throughout Europe. Then it was quiet in 1919, but reappeared in 1920. In 1925 there were 1630 deaths in the United States, a rate of 1.6 per 100,000. But when we look into the history of medicine, we find that even Hippocrates and Aretæus and others of the fathers of medicine describe a disease which we could interpret as encephalitis lethargica, or sleeping sickness. We note also that Sydenham observed in 1675 an epidemic with these same characteristics.

As its name indicates, it is an inflammation of the brain accompanied by a great deal of stupor. The inflammation in a large number of the cases seems to be located at the level of the cerebral peduncles in the tract which is limited in front by the nuclei of the motor nerves of the eyes and extending back to the gray nuclei at the base of the brain.

The general symptoms resulting from this localization are deep sleep and muscular troubles (such as twitching, etc.). The disease is notable for the absence or very slight intensity of the usual symptoms of meningitis.

The onset may be either sudden or gradual, the one about as often as the other. In the type with the gradual onset the patients complain at first of vague symptoms, such as loss of appetite, depression, fatigue, increasing headache, vertigo. Then there develops the somnambulism. For example, the patients at first continue at

their various occupations, but their lids are heavy and they are liable to fall asleep easily in the middle of the day. Gradually this need for sleep becomes unconquerable. Then ocular troubles appear and the temperature rises. These symptoms of the invasion of the disease last on an average from eight to ten days, or they may be prolonged over a period of two to three weeks.

When the onset is sudden a violent headache accompanied by chills ushers in the disease. The temperature rises rapidly to 103° to 105° F. Vomiting is frequent. There may even be some nosebleed. The patients complain of extreme lassitude with a tendency to sleep; and in three or four days the clinical picture is complete.

In still other cases the constitutional symptoms are slight. For example, the patients are seized suddenly with diplopia (that is, seeing double), or with muscular twitching, or with convulsions. Sometimes it is extreme pain which marks the beginning of the inflammation. Or, again, it may be a real delirium. Sometimes a sore throat is found at the beginning of the disease, but not usually enough to be of clinical importance.

There is usually a fever, but it has no uniform curve. Sometimes it is hardly noticeable. This fever may last some days to one or two weeks. Sometimes it has a morning remission, but occasionally the morning temperature is higher than in the evening. It usually ends by lysis. The pulse is rapid.

The urine will show sugar and albumin. The blood varies.

All ages are affected. Cases have been found in children under one year of age and in persons over seventy-five years of age. The greatest incidence, however, is during adult life, particularly between the ages of twenty-five and forty-five.

Encephalitis occurs in all seasons of the year, but the greatest incidence appears to be in February and March.

Prognosis.—At present it is impossible to give good

statistics as to the mortality of the disease because diagnoses have not been made in any but the most severe cases, and those in which death occurs. It may be said, however, that the prognosis of the disease is grave. If the patient recovers, it will only be after the lapse of months—possibly two or three years. The mortality can be fairly accurately estimated for adults at 10 per cent.; for children under the age of ten, approximatley 15 per cent. When there is improvement it is slow and accompanied by recurrences.

Treatment.—Since we do not know the causative factors of epidemic encephalitis, it is impossible to outline any definite line of treatment. It is best at present simply to care for the patient, keeping him quiet and protected from all sorts of insults and injuries until the condition improves. In other words, one uses symptomatic treatment of the same type that one would use in meningitis or any other disease of the nervous system.

CHAPTER XV

TETANUS—RABIES

Tetanus

Tetanus is the so-called "lock-jaw." It is an acute fever in which the muscles, particulary the muscles in the jaw and in the back, are in chronic spasm so that the patient cannot use them.

The disease is caused by the Bacillus tetani, which is a normal inhabitant of the intestines of sheep and cattle; and, therefore, is present in the dirt and in the manure piles, particularly of the thickly settled parts of the country. For example, in Europe one cannot pick up dirt without the danger of picking up therewith these bacilli.

The disease gains entrance into the body through an abrasion of the skin or more easily through a deep punctured wound such as that made by a rusty nail. Hence the danger of cuts from pieces of dirty glass and from rusty tools. Workers in the soil are particularly often exposed to infection. Cases arise also from the use of unsterilized shaving brushes, from the "blank" cartridges used in Fourth of July celebrations, and also in hospitals from infected catgut. In the warmer countries many cases of tetanus (trismus neonatorum) occur at childbirth from the infection of the baby's navel by the unclean midwife. In war the wounds of the soldiers become infected from the dirt, and tetanus is so liable that in the late war it was compulsory that every wounded man should receive a prophylactic inoculation of the tetanic antitoxin if it could be obtained.

In 1923 there were reported 1644 deaths from tetanus in the United States, a rate of 1.7 per 100,000.

The bacteria are anaërobic, that is, they grow in the absence of oxygen. Consequently, they do not grow as

easily in an open wound as in a closed one. Whenever, therefore, we are dealing with wounds suspected of being contaminated with tetanus bacilli we should not allow them to be closed, but should keep them wide open and should treat them with antiseptic solutions and sterilize them to their lowest depths.

The symptoms are not caused by the organisms themselves, but by the toxins liberated by the organisms. That is, the bacilli remain in the wound, but the toxins are absorbed by the blood-stream and are carried to the nerve-centers, where they cause a terrific spasm of the muscles.

Incubation Period.—The incubation period varies from two to fifteen days. When the disease begins after the lapse of more than six days from the time of infection, the prognosis is more favorable than if the incubation period be shorter.

Symptoms.—Inasmuch as the toxin of tetanus is a poison very much like strychnin, the first effects are those comparable to those from an overdose of strychnin. The first muscles attacked are usually the jaws, so that there is a stiffness of the neck and a difficulty of moving the lower jaw—what we call trismus. The spasm then spreads to the other muscles, and in particular the muscles of the back, so that the patient is so bowed over that he reclines with only the crown of his head and his heels touching the bed or surface. Simply touching such a patient will produce a spasm and intense suffering. Sometimes he suffocates because the muscles of the chest are so rigid that he cannot breathe.

Prophylaxis.—In any case where the wound has been made with an unclean instrument, or where the wound has been contaminated, there should be injected as soon as possible at least 1500 units of the antitetanic serum, if a serum is ready at hand. If there is no serum, it would be wise to open deep penetrating wounds and apply antiseptics, such as the solutions charged with nascent chlorin (*e. g.*, Dakin's solution). Tincture of iodin is

also good; as is also phenolated camphor. If all these are lacking, some good may be done by injecting hydrogen peroxid through a medicine-dropper or even a hypodermic needle. In general, the purpose is to prevent the closure rather than to hasten the closing of the wound.

Treatment.—When it is necessary to allay the spasms strong solutions of magnesium sulphate (23 per cent.) may be injected in the spinal canal in doses of 3 to 10 c.c. Apparently that does no particular damage. At any rate, the patients are able to relax. Outside of that, there is nothing to do but to use chloroform and morphin and make the patient as comfortable as we can.

Rabies (Hydrophobia)

Rabies is a virulent malady produced by the introduction of the virus either by the bite of animals or by the contamination of recent wounds. After a long incubation period the patient develops symptoms pointing to overwhelming excitation or of paralysis of the motor centers of the brain and cord, especially of those controlling swallowing and breathing. If the disease once develops, it leads usually to death. The virus (the real nature of which is unknown) can be found in the salivary glands of the patient and escapes with the saliva, hence the bad effects of the bite of an infected animal.

Rabies has been known from great antiquity. Xenophon describes rabies among dogs. Celsus also describes both the canine and the human forms. But it was many centuries later before Pasteur (in 1881) really worked out the nature of the disease and showed that the virus acts upon the nervous system.

In 1923 there were reported to the Census Bureau 55 deaths from rabies, a rate of only 0.1 per 100,000.

Incubation Period.—The incubation of rabies lasts on an average forty days. It may be as low as fifteen days and it may be as long as three months. During the period of incubation—say from five to eight days after the biting

—there may develop a fever which will remain from some hours to two days and then quiet down. This fever may recur several times during this period of incubation. Ordinarily, however, such fevers are not noticed.

Symptoms.—The prodromal symptoms are unrest, melancholia, lassitude, loss of appetite, coated tongue, vomiting, insomnia, rapid emaciation. The temperature rises, the patient chills, the pulse becomes frequent, and the respiration irregular. Spasms of the pharynx and larynx appear at intervals and cause that fear of swallowing which leads to the name—hydrophobia. About the second or third day hypersecretion of the saliva appears. The mouth is filled with a whitish foam. Thus expectoration is frequent and the patients may spit everywhere about them.

The duration of the disease varies from one to fifteen days. The paralytic type lasts from four to twelve days. The end usually is death.

The important thing about the pathologic anatomy is the presence in the brain or cord, especially in the ganglia at the base of the brain, in the medulla, and the neighboring centers, of peculiar looking bodies as large or larger than the cells, more or less of the shape of a kite. They are called the Negri bodies from Negri, of Pavia, who first described them in 1905. We look for these bodies in the brains of the dogs or other animals that have bitten children (or other persons) to determine whether the animals have had the rabies or not.

The treatment after the onset of the disease is usually without result. Treatment, to be effective, therefore, must begin as soon as the bite is received. Such prophylactic treatment is along the line of vaccination or immunization. That is, the weakened virus is used day after day in ascending doses until the patient becomes immunized. In order to get the virus for this purpose rabbits are inoculated with the virus and after death occurs the spinal cords are dissected out and dried. The

longer they are dried, the weaker the virus is. Extracts are made from these cords and injected under the skin of the bitten person. The oldest, or weakest, is used first, and then gradually the fresher, until finally extracts from the very fresh or fully virulent cord are injected. This is called the Pasteur treatment. The present system calls for fourteen injections—one being used each day.

After the fever develops relief of the worst pain is sought by the use of chloroform, morphin, or other depressants and analgesics.

Public Health Prophylaxis.—This demands the muzzling of dogs. During an epidemic even cats should be guarded against. Squirrels and wolves have spread the disease. Therefore, whenever rabies appears in a community all animals both wild and tame are potentially dangerous and should be kept at a distance or under restraint.

Individual Prophylaxis.—The prophylactic treatment of bites of animals requires that the site of the bites should be cauterized with phenolated camphor, carbolic acid, or caustic soda, and the wound kept open.

Only about 15 per cent. of persons bitten by mad dogs contract the disease. The danger depends greatly on the depth of the bite and whether the animal bites through the clothes or not. The exposed parts of the body, such as the face and hands, are naturally most easily infected.

CHAPTER XVI

ACUTE INFECTIOUS JAUNDICE—YAWS—FILARIASIS—TRYPANOSOMIASIS—RAT-BITE FEVER

Acute Infectious Jaundice

Infectious jaundice or epidemic catarrhal jaundice has been known for a long time to occur among troops, among sewer workers, among miners, and among agricultural laborers working in wet soil—as rice planters. It was recognized as a clinical entity by Ozenam in 1849, Monteret in 1859, Laveran in 1865, Lancerau in 1862, Landouzy in 1882, Mathieu in 1886, and Weil in 1896, who described 4 cases with typical symptoms.

It is an acute infection caused by the spirochete Leptospira icterohæmorrhagiæ, and is characterized by malaise, gastro-intestinal symptoms, and prostration at the outset, by fever of varying degrees, and by jaundice of varying intensity and varying duration. In severe cases bleeding from mucous surfaces and albuminuria are common. Light cases are clinically indistinguishable from ordinary catarrhal jaundice.

In most outbreaks the mortality is low, but in Japan the infection is both more prevalent and more virulent than in America. Among the Japanese the rates of the case fatality reach as high as 38 per cent.; while in the European soldiers in the Great War it did not exceed 2 or 3 per cent. In the United States in 1922 there were only 65 deaths reported, a rate of 0.1. In 1923 only 29 deaths.

The infection is endemic among rats on all continents. The disease in man is associated with moist soil and moderate temperature; that is, few cases occur in the hottest or the coldest weather. Sporadic cases occur, but usually the disease occurs in epidemic form, often with a high rate of incidence.

The disease is not easily conveyed from man to man, but probably only from rat to man. The spirochete is found in the kidney of the rat and is excreted in the urine, which contaminates the soil, and workers in the soil are infected either through abrasions of the skin or by contaminating their food with their dirty hands.

Treatment.—Patients should be removed from their contaminated surroundings and cleaned up. The drug given is usually arsphenamin. Otherwise simple digestible foods and good care are all that is required.

Yaws

Yaws is called *pian* by the French, *bouba* in South America, *Frambesia* by the Germans, and *yaws* by the English. It is caused by the Treponema pertenue, described by Castellani in 1905. It is not a venereal disease, but closely resembles syphilis. It is named from the raspberry-like appearance of the eruption. It is essentially a tropical disease. It is conveyed by direct contact, but there must be an abraded surface or small wound, for the parasite probably cannot enter through the normal skin.

Arsphenamin and neo-arsphenamin provide an effective treatment.

Filariasis

The symptoms of infestation by the various forms of filaria are abscesses, lymphangitis, varicose groin glands, varicose axillary glands, lymph scrotum, cutaneous and deep lymphatic varix, orchitis, chyluria, elephantiasis of the leg, scrotum, vulva, arm, etc., chylous dropsy of the tunica vaginalis, chylous ascites, and chylous diarrhea. In other words, sometimes the swelling of the legs, or of the scrotum, or of the glands under the arms, or in the groin may be due not to an edema from heart disease or kidney disease, but to the blocking up of the lymph-channels by these long thread-like worms called filaria.

The adult worms live in the connective tissue, the lymphatic and the body cavities, but the embryo or larvæ are found in great numbers in the blood. While in the blood they seem to do little damage, and the greatest injury resulting from their presence is the mechanical one referred to above.

Mosquitoes transmit the disease.

The most important filaria of man are: the Filaria bancrofti, the larvæ of which are known as Filaria nocturna, since they appear in the blood only at night, and which

Fig. 34.—The Microfilaria bancrofti in the human blood.

are to be found in all the subtropical lands, including America; second, the Filaria loa, the larvæ of which are known as Microfilaria diurna because they appear in the blood only by day. This disease is prevalent in West Africa and India. Third, Filaria perstans, the larvæ of which are known as Microfilaria perstans. These larvæ appear in the blood both day and night, and the disease is found in West Africa.

Bancroft's filaria is a whitish or brownish transversely striated worm, 44 to 95 mm. long by 0.1 to 0.26 mm. in diameter. The male has two spicules 0.2 and 0.6 mm.

long and anogenital pore 138 mm. from the tail. The preanal papillæ are uncertain, but apparently there are three pairs of postanal papillæ. The vulva of the female is 0.66 to 0.75 mm. from the head. The anus is 225 micra from the tip of the tail. The larvæ are 330 to 340 micra long by 6.6 to 8.5 or 11 micra in diameter. They are found in the circulating blood and are provided with a sheath and sharply pointed tail. They show a more or less marked periodicity in that they are much more numerous in the peripheral circulation during the night, but if sleep is reversed to daytime, the periodicity is also reversed.

Mosquitoes while biting patients swallow these larvæ, which later undergo development in the muscles, and finally, after fourteen to seventeen days, or by lowered temperature up to thirty-five or forty-one days from the time of infection, the larvæ reach the stage in which they are transmitted to man during the bite of the mosquito.

The **Filaria loa** is found most notably near the eye in the subcutaneous fascia around the orbit between the conjunctiva and the bulbus. It may travel over the nose. It disappears from the surface in two or three days and reappears after some days, weeks, or months. Its appearance is favored by warmth and retarded by cold. It causes an itching, creeping, prickling sensation with occasional edematous swelling, and in some cases inflammation and considerable pain. Such larvæ may be pulled out by incising the skin and overlying tissue and using a pair of forceps.

These two types are sufficient to illustrate the disorder.

Treatment.—The treatment is chiefly by rest, and excision of the worms when they appear near the surface.

Prophylaxis.—The prophylaxis demands that persons infected with filaria must be kept from mosquitoes in order to prevent the spread of the disease.

Trypanosomiasis

This is a tropical disease due to an animal parasite, a trypanosome of the protozoön class, found in the blood of its victims. Trypanosomiasis is best known under the name of the African "sleeping-sickness." This should not be confused with encephalitis lethargica, the "sleeping-sickness" of Europe and America. The symptoms of trypanosomiasis in general—such as are found in the Philippines—are an irregular fever, emaciation, loss of strength, swelling of the lymph-glands and the spleen, and edema of the feet. The form of trypanosomiasis that occurs in Africa is called the sleeping-sickness and presents a latent period of five years or more, and is characterized by apathy, mumbling, tremor, and difficult locomotion, gradually deepening into drowsiness and sleep. The patient finally dies of some secondary infection such as septic meningitis. The patient lives usually from three months to a year after the beginning of the active symptoms.

Sleeping-sickness is transmitted by biting flies, especially the tsetse fly (Glossina palpalis). Fig. 1, page 26.)
It used to be limited to tropical Africa, especially to the shores of Victoria Nyanza and about the head waters of the Nile, but, unfortunately, it is gradually spreading.

The cause of the disease is the Trypanosoma gambiense discovered by Dutton in 1901. The trypanosomes are found in the cerebrospinal fluid, in the enlarged lymphatic glands, and also in the circulating blood of the victims. It seems that when the trypanosomes are inoculated through the skin by the tsetse fly, they are temporarily blocked by the lymphatic glands. From here small numbers of them pass into the circulation and thus to other parts of the body. They are always in the fluid, never in the cells or tissues.

Prophylaxis demands that the tsetse flies should be exterminated just as we seek to exterminate the mosquito for its part in the transmission of yellow fever and malaria.

This is being attempted wherever Europeans have obtained control. Where such measures are impracticable, the natives are moved away from the infected districts.

Some cases of trypanosomiasis recover if found early and subjected to rational treatment.

The best remedies thus far suggested are arsenic derivatives. Thus trypan red, arsphenamin, etc., are used with sufficient success to warrant a continuation of effort along this line.

Rat-bite Fever

This is called sodoku by the French, and Ratbissen Krankheit by the Germans. It is caused by a spirochete carried by the bite of a rat.

Incubation Period.—The incubation period may vary from two weeks to two months.

Onset.—The onset is sudden. The visage of the patient is red, the tongue coated, the fever is intermittent. Each febrile attack is characterized by three stages—that of the chill, of the fever, and of the sweat—and lasts from three to four days, and recurs at varying intervals. Often there is an exanthem. All over the body appear red or violet maculæ, or there may be a generalized urticaria or papules, resembling syphilitic papules. The site of the bite is swollen and red, with or without vesicles.

Complications.—The complications are infectious endocarditis, pulmonary congestion, bronchopneumonia, nephritis, localized edema.

Prophylaxis.—Prophylaxis requires that every rat bite be cauterized and disinfected.

The disease may end in death. In Japan the mortality runs around 10 per cent.

CHAPTER XVII

THE PLAGUE—LEPROSY

The Plague (the Pest)

The plague has more than a theoretic interest to us now that endemic foci have been apparently established in the United States in four places—that is, in California, in New Orleans, in Texas, and in Florida. In 1920 there were 49 fatal cases in these foci. The other foci of the disease are in Asia and one in Africa.

Like influenza, the plague has visited the whole world in serious pandemics. The last one cost probably some 10,000,000 lives when it visited apparently every part of the globe between 1898 and 1917. Such a pandemic was probably what was called the "black death" of the fourteenth century. Again, there was the great plague of London described by Defoe in 1665.

The disease is caused by a bacillus (Bacillus pestis) which invades the blood as well as the lymph-glands and the lungs of its victims.

It is transmitted by fleas, especially the fleas that live on rats, squirrels, and other rodents.

Its case mortality is very great, varying apparently from 70 to 90 per cent.

It appears in three forms: the bubonic plague, the pneumonic plague, and the septicemic plague. The first is so named because the glands become infected, swell up and ulcerate, especially the glands of the groin. In the septicemic type there is, of course, an infection of the entire body including the blood. The pneumonic type, on the other hand, is a virulent infection of the lungs. This type of the disease is notable for the fact that it may

be communicated from person to person through the sputum and droplet infection.

There is a light form often at the beginning of the epidemic called the pestis minor, or ambulant form, in which there is only the swelling of the glands and a few days of fever. But the usual form, the pestis major, begins like most septicemias with backache, malaise, and mental depression. The fever rises steadily for three or four days, to reach finally 104° to 106° F., and then drops a degree or two, after which a secondary rise appears. The tongue is brown. The glands, especially those of the groin, swell. There are purple spots or petechiæ all over the body. Death occurs ordinarily after three or four days, except in fulminating cases, where it may occur in twenty-four hours.

Treatment.—The treatment, of course, is unsatisfactory, but something may be done by good care and nursing. If there is time one can use an injection of vaccine (Haffkine). Then there is a serum (Yersin and Roux) that may be used. The patient should be kept as comfortable as possible with ice-bags and cold applications, cooling drinks, etc.

Prophylaxis.—The segregation of the ambulant cases is of extreme importance in order to prevent the development of an epidemic. It must be remembered that the clothing, the urine, the feces, the sputum, in fact, everything that comes in contact with the patient is liable to carry the virus, and, therefore, should be destroyed or thoroughly sterilized. The bodies of the dead should be cremated and the convalescent should be kept isolated for a month after the subsidence of the fever.

Inasmuch as vermin and rats are the chief means of spreading the disease, a campaign for their extermination should be undertaken and continued. To exterminate rats there has been used a disease caused by the Bacillus Danysz. This is spread among the rats by means of infected food placed for them to eat.

Then buildings should either be fumigated or burned. The fumigation, of course, has to be done with sulphur as much as with formaldehyd.

To illustrate the nature of the disease the following case history taken from the Journal of the American Medical Association for February 4, 1911, from an article by Dr. A. N. Sinclair, is given herewith:

"**History.**—I first saw this patient at the Immigration Station on June 7, 1910, at about 11 A. M. She had complained of headache and nausea the day before, with some fever, and her illness was attributed to the eating of preserved eggs, which her father had brought with him from Siberia. When I saw her in consultation with Dr. Ramus she was in bed, feeling too ill to be about. The facies at once impressed me as suggestive of plague: the wrinkled brow, half-closed eyes, and drooping mouth united in producing that 'worried look' so frequently accompanying plague.

"**Examination.**—A swelling was made out in the neck, under the angle of the jaw. The tumor was about the size of a hen's egg—indurated, but uniformly smooth to the touch, and showing no evidence of its multiglandular structure. It was exceedingly painful on manipulation, although there was but little redness and edema as the skin over plague buboes in other situations. Temperature was 102° F., and in view of the fact that the girl's father was in a similar condition (but with a bubo in the right groin, in which a bacillus resembling that of plague had been found), a provisional diagnosis of plague was made. The gland was not punctured or incised for examination, however, as owing to the difficulty in securing healing, or even preventing sloughing, in buboes so treated, I have long since avoided tampering with a bubo in the cervical region, where the occurrence of sloughing can so easily endanger so many important structures.

"**Treatment.**—The patient was removed to Quarantine Island, and on June 8th I was detailed by Dr. Ramus to

take charge of her and the other patients. On this date her condition was much more serious, the hebetude having increased, and there being considerable pain in the chest on the left side. The percussion note over the whole of the front of the chest as far down as the cardiac dulness was diminished in resonance, there was a shortening of the expiratory murmur, and some fine subcrepitant râles. The administration of the Yersin-Roux serum was decided on, and at 6 P. M. she received an injection of 30 c.c. The supplementary treatment consisted of a tablespoonful of whisky in a glass of milk every four hours, alternating every two hours with 5 minims of tincture of digitalis and 1/40 grain of strychnin.

"Course of the Disease.—June 9th: She slept well, and her temperature had fallen from 102.2° (the evening before) to 99.6° F., the pulse, however, remaining the same, 120, and the respiration increasing from 32 to 36. By evening the temperature had risen to 103° F., and the pulse was 128 and respiration 38. The progress of the involvement of the lungs was not much further than the day before, although the left apex was involved.

"June 10th: There was no marked fall, as occurs in the mornings in favorable cases; instead there was a fall of but two-tenths of a degree; pulse was 120, respiration 36. By evening the temperature had risen to a higher point than it had yet reached, 104° F., pulse 140, respiration 38. The patient became delirious about 8 P. M., muttering and picking at the bedclothes.

"June 11th: At 6 A. M. temperature was 105.6° F., and she died about 8 A. M.

"Autopsy.—Postmortem examination showed microscopic evidences of plague. The enlarged cervical gland was removed; it was deeply infiltrated with a hemorrhagic exudate, being very dark red in color, and extremely friable.

"The pleura was adherent to both lungs by a fibrinous exudate, and so firmly attached that some difficulty was

experienced in removal of the lungs. The greater part of the lower lobe of the right lung was congested, but not entirely so, the evidence being of a lobular rather than a lobar pneumonia.

"The upper lobe of the left lung, while not so extensively involved, presented similar conditions. The pericardium was distended with bloody serum. The left ventricle of the heart was empty except for the presence of small chicken-fat clots, which condition also obtained in the right ventricle. The liver was congested, but presented no mottled areas on its surface, although evidences of fatty degeneration were evident on section. The spleen was greatly enlarged, with undue prominence of the pyramids, which were congested. There were evidences of glomerular hemorrhage under the capsule, which stripped easily.

"Bacteriologic Examination. — Smears from gland, lungs, and spleen showed typical plague bacilli. A guinea-pig was inoculated with a piece of lung and another with a piece of spleen, both on June 11, 1920. Both pigs died on June 16th, and from them the bacillus was recovered in pure culture."

Leprosy

Leprosy prevailed in epidemic form in Europe in the Middle Ages. But the disease has practically disappeared from central Europe and remains only along the coast lines of the continent. It is estimated that there are from 5000 to 6000 lepers in the Philippine Islands, and there are many cases in China and Japan. In India the census of 1910 showed an increase from 100,000 to 110,000 during the previous ten years. Leprosy is also on the increase in southern Africa. The greatest incidence is found among the natives of the Hawaiian Islands, where 1 in every 40 or 50 has the disease. The report of the National Leper Home for the year ending June 30, 1926, shows that 394 lepers have been hospitalized there since 1921. In the fiscal year 62 were admitted and 29 died.

The cause of leprosy is the Bacillus lepræ, discovered by Armauer Hansen in 1874. Leprosy resembles the bacillus of tuberculosis in many, though superficial respects. It stains more readily and decolorizes somewhat more readily than the tubercle bacillus, but differential reactions are not trustworthy. It differs from the tubercle bacillus in that it grows with difficulty on artificial culture-media, in primary cultures, and is non-pathogenic in the lower animals. Furthermore, lepra bacilli are usually found in dense cultures and in much greater numbers within the cells than is the case with the tubercle bacillus.

The disease is spread chiefly by direct contact and is not easily transmitted. It also has a possibility of indirect contact, but this has not been proved.

The bacilli of leprosy are found in the circulating blood and secretions.

There are two types of leprosy: first, the nerve type; and second, the nodular.

In the nerve type, when first seen, the patients have areas of anesthesia, muscular atrophy, contractures, and even ulcers. But the very beginning of the disease is probably accompanied with pain, numbness, swelling of the extremities, blebs on the skin, twitching, tingling, and various other sensations. The appearance of bullæ, or blebs, along the course of a nerve quite frequently accompanied by fever is diagnostic (Honeij). Areas of pigmentation, or depigmentation, are also suspicious. The course of this type is very slow—usually lasting from ten to twenty years—and sometimes seems to be practically stationary.

The nodular type is characterized by the loss of the eyebrows and by small indurations of the skin. The nodules appear first on the wrist and on the chin and over the eyebrows. But this condition is preceded by glandular enlargement, small ulcers, obstructions and irritations, running of the nose, nosebleed, fever, and various abnormal sensations. So they should be looked for in sus-

picious cases. Then the skin becomes thickened and corrugated. Finally come ulcerations, gangrene, dropping off of the toes, etc. This type of patient lives from five to ten years.

Treatment.—The best treatment now-a-days is with the chaulmoogra oil. The beginning dose is 0.5 hypodermically, twice a week, increased according to the reaction of the patient. Accompanying this, of course, good sanitation is to be demanded and very careful personal cleanliness. This latter includes excellent care of the teeth and mouth, the cleansing of the nostrils, as well as the cleansing of the body.

Prophylaxis.—Prophylaxis demands the segregation of these patients, for this has worked well for several generations and has cleared the interior of Europe of the disease. It should, therefore, be continued even while we are introducing the newer types of treatment.

CHAPTER XVIII

VENEREAL DISEASES

It was not until the decade of the eighties of the nineteenth century that morbus venerei was differentiated into its component disorders. Until then it seemed to be believed that venereal disorders were due to excess—to overindulgence—and the accompanying alcoholism. However, in 1884 Neisser found that a diplococcus was the causative agent in that form of venereal disease characterized by a white purulent discharge from the urethra (and in the female from the vagina also). This he named the gonococcus. It lives within the cells as well as in colonies outside the cells of the infected tissue, and looks very much like two half-coffee beans, or half-biscuits cut apart, but lying side by side. It was found that the gonococcus is capable of setting up an inflammation in the mucous membrane not only of the genital tract but also in the conjunctiva of the eye, and in the urethra and other urinary organs.

In the nineties it was demonstrated that there were three forms of disease grouped under the term "morbus venerei": the gonorrhea already mentioned, the soft chancre or chancroid, and the hard chancre or the primary lesion of syphilis. In 1905–06 Schaudinn, of Hamburg, found in all syphilitic lesions a minute organism which looked like a snake or spirillum. This he called the Spirochæta pallida. (It is also called Treponema pallidum.) This organism sets up the disorder known as syphilis whenever grafted into anthropoid apes, and, therefore, seems undoubtedly the causative agent of that protean disease.

It remains, therefore, for the medical world to work out the pathology of the soft chancre; although it is generally believed that this is nothing more than the infection of a denuded surface with some of the common pus-forming organisms, but it may be due to a specific bacillus, called bacillus of Ducrey.

While gonorrhea and syphilis may both be innocently acquired, their chief mode of transmission is by sexual intercourse. The diseases are as old as civilization and quite as wide-spread. Because the diseases are in their very nature disgraceful, they are concealed and inadequately treated. Isolation and quarantine as established for other infectious diseases cannot be applied to them. Therefore, the best that medical men can do toward stamping out these diseases is to educate the growing generation as to their dangers and pathology, and trust to the growing moral sense of humanity to avoid the occasion for acquiring them.

Prevalence.—One hears all sorts of wild guesses as to the prevalence of venereal diseases and particularly of syphilis. From reports of the army in 1907 we find that venereal disease as a whole was found in 167.8 per 100,000 men. In 1909 the army reports showed 13.45 per 100,000 from syphilis, 30.77 from chancroids, 35.77 from gonorrhea. From the navy reports in 1909 we find 26.49 for syphilis, 28.23 for chancroids, 105.11 for gonorrhea. At the beginning of the World War it was found that after they had gotten to camp, that is, after all rejections had been made, there still were found 5.4 per cent. of the recruits suffering from venereal diseases. Estimates of the prevalence of venereal diseases in the civilian population, of course, are more or less guesses, depending upon who makes the guess. The specialist in genito-urinary diseases sees so much of that sort of thing that he is inclined to think that the percentage is very high, and a practitioner having a high-grade family type of patients finds a much smaller percentage.

Cunningham says that 60 per cent. of the males have had at some time venereal disease; 20 per cent. have it before twenty, 50 per cent. before twenty-five, and 80 per cent. before thirty years of age. Morrow, who has headed the work against venereal disease in New York City, estimates that 75 per cent. have had syphilis. The reason for mentioning males is that males are largely the carriers. That is, the disease gets into the family life largely through the male, less often through the female.

Syphilis

Syphilis is now very prevalent and forms the background of many cases of heart, nervous, abdominal, and skin diseases. It becomes embedded in all the body tissues very early in its course. It may be transmitted to the offspring. It justifies, therefore, its popular name of "blood disease." The diagnosis is now made by the help of a blood test called the Wassermann reaction. This, in the hands of a careful technician, is about 80 per cent. accurate. Therefore, in case of doubt the test should be repeated two or three times.

Transmission.—Transmission is by direct contact. Many times, however, the virus may be transmitted by objects which keep the virus moist. Consequently a wet towel will convey gonorrhea or syphilis. So also has the drinking-cup claimed many victims. Another illustration of the manner of transmission is seen when a chancre on the lip spread syphilis among the girls at a party playing kissing games.

Transmission by carrier is also influential in the spread of the disease, for the carrier in syphilis is usually the male who has a latent disease. The carrier lesion is hard to detect. In the male the lesion that produces this effect is usually in the testes and the spirochete is carried with the semen. The carrier is temporarily immune to the toxic effect of the parasite, although he carries the parasites themselves about in his body.

The diagnosis of this infectivity is difficult. It is advocated by many that health certificates should be issued before marriage. This presents a difficult problem to the maker of the certificate, for often the carrier is unaware of his condition. The primary lesions were mild and unnoted. The only thing that can be done is to have the blood examined for the Wassermann reaction and that done under conditions that exclude other diseases. Weak reactions and indefinite clinical examinations may occur and leave one in doubt as to the final results.

Transmission within the family: There are two laws that are quoted in the literature. The first is called Colles' law: A woman who has borne a syphilitic child is immune to syphilis, although she may present no signs of the disease. (She already has syphilis and, of course, cannot contract the disease until this infection has been removed.) The second is Profeta's law: If a woman suffering from syphilis in its contagious stage bears a child which shows no taint of the disease, the child may be suckled by its mother with impunity and will not contract the disease.

Syphilis is absolutely a disease of the human race. However, it has been conveyed to a few grades of the higher class of apes. In human beings there is no absolute immunity to the disease. If a patient has had syphilis and is cured of the syphilis, that patient may take it again. But there seems to be good ground for believing that the existence of syphilis in a community for some length of time renders that community slightly immune toward it. There is no absolute immunity.

When the disease is inherited, it is usually the eldest child which suffers most and often it is only the first-born. The transmission to the third generation is not quite proved, although we often quote the word of Moses that the curse will descend to the children's children.

Course of the Disease.—The course of the disease is divided into three stages—the *primary*, the *secondary*,

and the *tertiary*. The first, or primary, lesion is the chancre—the Hunterian chancre—named so for the man who described the condition so clearly.

The incubation period leading up to the appearance of the chancre is somewhere from two to five weeks. The earliest that has been known is ten days, and that in experimental work.

The chancre itself is quite painless. It is free from sensitiveness on pressure. It forms a brownish-red, button-like nodule with a firm center and may form an ordinary ulcer. It is always circular or nearly so. It usually measures from 1 to 1½ cm. in diameter. The base is indurated and hard, the edges are sharply defined. It has a definite induration and does not show a large red area or roseola. A characteristic feature is its mobility. You can move it under the overlying skin. If it ulcerates and there is a sore, the base is a brilliant red. The secretion is scanty and thin and it rarely suppurates. It feels like crackling parchment to the touch. There are no constitutional symptoms with the chancre. There may be a few glands in the neighborhood involved, but not many. Usually this sore will disappear of itself after a time and leave no trace at all. Consequently, it is often impossible to prove that there has been an initial lesion.

The second stage is the stage of generalization. This occurs four to eight weeks after the appearance of the chancre. The stage, as a whole, may last a few weeks or several months, depending on the treatment. The general symptoms are loss of weight and strength, general malaise, poor appetite, a heavy type of headache frequently worse at night, tonsillar swelling independent of patches. Sore throat is complained of frequently. When the angina spreads to the uvula, the resulting picture is almost pathognomonic because it is so characteristic with the inflamed area a dark crimson and separated by a sharp border from the surrounding pink. The lingual tonsils

may also be swollen. The spleen is sometimes enlarged. Anemia is always present. The patellar reflexes may be abolished in this stage. There is enlargement of the lymphatic glands—the most frequent lymphatic glands to be affected are the postcervical. (Tuberculosis affects the anterior cervical.) Next is the sternomastoid, then the submaxillary. The swelling of the epitrochlear gland is suspicious. Fever is frequent. There is often a syphilitic arthritis. Such joints have a dull ache rather than sharp pains. They are not swollen, tender, or red. The pains are worse at night than in the daytime. The pains may come and go. Probably the most characteristic pains of this type are those of the long bones, clavicle, sternum, and the tibia.

The cutaneous and mucous lesions are very characteristic. The cutaneous lesions are generally circular in type. They may appear on the face, on the chest, or elsewhere. They have a copper color like raw ham, and show a raised collarette. They do not itch. They have a tendency to disappear without leaving any trace. Alopecia (baldness, or loss of hair) is often present. It may be present during the third or fourth month of the disease and may be general or circumscribed, the patches varying in size from a lentil to a quarter. The hairs drop out in patches so that the scalp looks moth eaten.

The most important, however, are the mucous patches most often seen in the mouth, although they occur in various other places. They are dirty looking. They may occur in the buccal cavity, the rectum, the mouth, etc. When subject to neglect such a patch becomes a condyloma (latum), most often seen in and about the rectum. It is broad, flat, with dirty secretion. It looks as if it were a fungus growth. These patches are most infectious and are to be handled with gloves protected by dipping in an antiseptic solution.

The tertiary stage occurs about three or four years after the chancre. In many cases (as in "galloping" syphilis)

one may find tertiary symptoms even in the nervous system within a few months. Sometimes the two stages follow one another without intermission. The longest known interval is fifty-five years.

The respiratory system may show gummata of the lungs. Syphilis of the alimentary canal with stomach ulcers, etc., is common. There may also be a sort of inflammation of the liver; and the spleen may be attacked. One may recover the spirochete in the deeper layers of the aorta and tissues of the bladder. Syphilis of the nervous system presents itself in the form of paresis, tabes, locomotor ataxia, meningitis, or as a frank neuro-cerebral syphilis.

The characteristic lesion of the tertiary stage is the gumma. This is an infectious granuloma; that is, a tumor caused by the reaction of the tissues to some infectious agent. In this tumor there are no blood-vessels. Consequently, the size of the gumma is self-limited. It cannot remain nourished when the arteries do not reach into the tissues. Consequently, gummata break down of themselves. Under the microscope it is very difficult to distinguish giant-cells of tuberculosis from those found in gummata. But when the gummata break down there is quite a distinction. Tuberculosis leaves a cavity because of the general softening of the lesion. There is no time for the regeneration of the tissue. In syphilis the breaking down occurs gradually, beginning at the center, and the tissues have time to regenerate, thereby leaving only a small scar. The gumma is the chief cause of trouble in syphilis of the brain, lungs, intestines, liver, and spleen. The prognosis of the gumma is very good if the patient survives the disease itself.

Congenital Syphilis as Opposed to Acquired.—When the fetus is affected the usual result is the interruption of pregnancy (abortion or miscarriage). When there are two or three miscarriages and then a normal birth, one is justified in suspecting the presence of syphilis. In 330

cases of gravidity with syphilis there was abortion in 40 per cent., that is, only 60 per cent. reached term. The ill effects on children born of syphilitic parents manifest themselves in three ways: (1), faulty nutrition, inequality of growth; (2), actual signs of syphilis in the child at birth; and, (3), the signs of the disease appearing in the child some time after birth in a child born healthy. Ordinarily, when the child is born healthy at term, all goes right until about the sixth week. Sometimes the symptoms may be delayed until the sixth month.

A description of the syphilitic child given by Trousseau is that of a "little old man," the skin yellowish, the eyelashes wanting, patches of alopecia, characteristic rhinitis (snuffles), pemphigus or blisters on the hands and soles of the feet. When pemphigus appears the child usually dies within a day or two.

Late congenital syphilis occurs usually about the second dentition or the age of puberty—eight to twelve—but it may be developed in the twenties, but no case older than twenty-eight has been found.

The most pathognomonic change in congenital syphilis is interstitial keratitis. The cornea of the eye is covered with a haze which starts somewhere near the center of the cornea and spreads out. Fissures may occur in the mouth. There is hyperostosis of the long bones, such as the saber-shaped tibia. The presence of the "Hutchinson triad"—the teeth saw-edged, the enamel wanting on the lower portion, disturbance of vision and hearing—is sufficient to diagnose congenital syphilis. There may also be signs of infantilism—slender physique, undeveloped testes, lack of pubic hair, glandular enlargements, arrested development of the brain.

The prognosis of congenital syphilis is bad. The average mortality is somewhere above 75 per cent. One-third die in the womb, 34 per cent. of the remainder die in the first six months of life.

Treatment.—Fortunately, syphilis yields to medicinal

treatment, and if patients would only take adequate treatment the disease would soon be restricted in extent. The term of treatment is at least three and one-half years. That is, a syphilitic should during this period take frequent courses of treatment, their length and frequency being varied by the physician as the occasion may demand.

The drugs used are three: mercury, arsenic, and the iodids. Mercury (Ung. hydrargyri) may be rubbed into the skin for forty successive doses and then a rest taken. Or it may be injected into the gluteal muscles, or even into a vein. Arsenic is used in the form of a benzol compound. The best known is arsphenamin and neoarsphenamin (formerly known as salvarsan, neosalvarsan, arsenobenzol, and diarsenol). This is injected into the veins. Naturally, since these drugs are so powerful, they must be used with great care and under very rigid supervision. Many deaths have already occurred from their use—some of them due to carelessness. The iodids are used by the mouth. In some people they give rise to a disagreeable taste and to skin eruptions.

When a nurse is directed to use a mercurial inunction, she should use the so-called "blue ointment," and rub in a piece the size of a pea every day. She should apportion the body of her patient into six parts, and use the ointment on a new part each day for the six days. Then the patient should have a hot cleansing bath and the inunctions begun all over again. For these reasons the patient should be clothed in old underwear, such as he can burn up at the end of each six-day period. The usual apportionment of the body is the following: first day, left arm; second day, left leg; third day, right arm; fourth day, right leg; fifth day, back; sixth day, chest and abdomen. The nurse should, of course, wear gloves when rubbing the patient—gloves that do not absorb the mercury. She should be very watchful of the cleanliness of the patient's mouth, lest he become insalivated. Hydro-

gen peroxid should be used to cleanse the mouth three times a day.

Primary lesions, the condylomata, and the ulcers are kept dry by dusting frequently with powdered calomel. The secretions of all these lesions are exceedingly contagious. The nurse should, therefore, disinfect herself thoroughly and be sure not to carry any utensil from a syphilitic to another patient.

Patients with syphilis should not marry until after four years of careful treatment. Those with gonorrhea not until gonococci cannot be found in the secretions of the genito-urinary tract.

GONORRHEA

Gonorrhea is essentially a local disease of the mucous membranes and sets up a thick purulent discharge wherever inoculated. It does not confer immunity, nor does it form a general antitoxin; and, therefore, may be inoculated from one part of the body to another, as, for instance, when the pus from the urethra is touched to the eye, it sets up a violent inflammation. So, also, the disease may be had as often as the patient becomes recipient of a new infection.

Robinson says that 25 per cent. of the male population has suffered from gonorrhea. Erb says that 4 per cent. of the women married to husbands who had had gonorrhea contracted the disease. Probably a better general estimate would be 10 per cent.

The gonococcus is a diplococcus notable in two respects —it is decolorized by the Gram method of staining, and it is also found within the cells of the pus examined, thus differing from other types of diplococci found in similar locations.

The incubation period varies from one to four days.

The first symptoms of urethral gonorrhea (gonorrheal urethritis) in the male subject are the pain and burning on urination and the creamy discharge. There may be

developed a frequency of urination which keeps the patient in almost constant pain, or it may be almost impossible for the patient to pass urine. This condition, if untreated, continues for a week or two, and then the discharge gradually grows thinner and the irritation changes its character. In perhaps half the cases the disease remains in the anterior urethra and becomes chronic, starting up afresh whenever there is a local irritation or a constitutional weakness develops. Thus, the drinking of alcoholic liquors, fatigue from overexertion, and venereal excess all tend to kindle afresh the latent inflammation.

When (we are still discussing the disease as it manifests itself in the male), instead of settling down and becoming chronic in the anterior urethra, the inflammation progresses upward in the urethra, it may set up a cystitis, or it may pass by way of the vasa deferentia to the testes and there set up an orchitis. The cystitis may develop into an inflammation of the ureters and thence to the kidneys; while the inflammation of the vasa occludes them and renders the passage of the spermatozoa difficult. The former leads, of course, to a general infection and possible death; the latter, to sterility.

In the female, gonorrhea may cause a urethritis and cystitis, but the usual infection is that of the vagina. In the vagina the glands of Bartholin receive the chief infection and retain it indefinitely. From the vagina the cervical canal and the endometrium become infected (endometritis), thence the tubes (salpingitis), and the peritoneal membranes surrounding the uterus and its adnexa (pelvic peritonitis, the so-called perimetritis, etc.). The effects of a cystitis are the same as in the male. The effects of the endometritis and the salpingitis are dysmenorrhea and barrenness. The latter effect is so frequent that it is believed that 40 per cent. of the barren marriages are due to gonorrhea.

If not rendered barren at once by the receipt of the

gonorrheal infection, a woman is apt to become so immediately after the birth of her first child, because the disturbance of the tissues due to the birth reinflames the now very susceptible tissues and the tubes become occluded. Hence, a great number of the one-child marriages are due to gonorrhea.

When the gonococci become absorbed into the circulation, they are apt to settle in some joint and set up an arthritis, usually monarticular, and accompanied by fever and other constitutional disturbances. This gonorrheal rheumatism is particularly liable to be accompanied by a fatal ulcerative endocarditis, and thus end the tragedy.

Gonorrhea is then a disease not to be lightly esteemed. Moreover, it is a disease very difficult to cure. The curing of it requires a long continuance of a very vigorous treatment—just what, as we have seen, it does not ordinarily receive. The treatment is essentially local and consists of irrigation with antiseptic solutions and the application of soothing medicines. Even when medicines are given by the mouth, they are given for the sake of their local effect on the urinary passages while being excreted through the kidneys.

Nurses who treat gonorrheal patients should wear rubber gloves when giving the irrigations, baths, and other local treatment. They should also be careful to change at least their aprons before going to their dormitory or mingling with other people. They will do well to keep a basin of lysol or mercuric chlorid solution in the room and moisten their hands in it frequently. Wash-cloths, towels, and treatment utensils should not be used with other patients until they have been thoroughly sterilized. The part most liable to infection is the eye. For this reason the almost involuntary rubbing of the face and eyes should be watched out for by the nurse while treating gonorrhea. It is for this reason also that the towels used

by patients suffering with gonorrhea must be most scrupulously accounted for.

In all gonorrheal troubles rest in bed is the first essential of successful treatment. Pelvic peritonitis, dysuria, and other painful affections are best treated by the local application of heat. Thus, the hot pack, reinforced by an incandescent lamp, renders the patients quite comfortable. In making an effort to exterminate the gonococci we employ germicides, the chief among which are the salts of silver. Of these, the nitrate in a 1 to 2 per cent. solution is the most effective; but since its application to mucous surfaces causes great pain, one of the albuminates of silver is usually chosen instead. Whatever is used, the nurse should remember that it is the thoroughness of the irrigation—the completeness and frequency of the washing of the tissues—that helps, rather than the chemic effect of the germicide.

The Fourth Disease

There is another type of venereal disease, sometimes called the fourth disease, which resembles Vincent's angina of the mouth in that one finds a mixture of fusiform bacilli and spirochetes in the pus. Its identity has not yet been proved. At any rate, it is treated in the same way that Vincent's angina would be treated.

Venereal Warts

In speaking of syphilis, we have mentioned a condyloma latum. There is also a pointed condyloma called the condyloma acuminatum, which may be called the venereal wart. These warts are entirely distinct from syphilis because they are due to dirtiness and neglect, and are easily cured by cleansing the surface and applying nitric acid to the wart and using antiseptic solutions in general.

Vulvovaginitis

The vulvovaginitis in little girls is not always due to the gonococcus. Sometimes organisms resembling the gonococcus are found in the discharge from these children, and sometimes it is the real gonococcus. But they are less virulent than usual and seem to have a different nature. However, the affection is very obstinate and requires months of treatment with careful cleansing and the use of general antiseptics.

Chancroids

Chancroids are ulcers differing from the chancre in that the base is soft and they are more liable to ulcerate. The chancroids are caused by the bacillus of Ducrey. They seem to have no constitutional effects and disappear after being treated with local antiseptics.

CHAPTER XIX

INTESTINAL PARASITES AND THE TRICHINÆ

From earliest infancy micro-organisms of various sorts inhabit the human intestines and have much to do with the fate of food in the digestive tract. Some of these appear to have no effect on the general health, while others liberate toxins of the deadliest sort. Of the former the most common is the Bacillus coli communis; of the latter, the Bacillus typhosus; while the animal parasites occupy an intermediate position. The latter, such as the worms, offer insult to the organism because they obtain their nourishment by sucking blood from the intestinal walls, and thus may set up hemorrhages sufficient (because of their number) to cause grave anemia.

The *pin-worm* or seat-worm (Oxyuris vermicularis) measures 4 mm. for the male and 10 mm. for the female. It inhabits the lower bowel. It causes intense itching about the anus and genitals. Besides this there are reflex nervous symptoms, such as grinding the teeth and general irritability. The diagnosis is easy because the worms are easily detected by their white color and movement in the stools. The treatment is by active purges accompanied by intestinal antiseptics, followed by antiseptic enemata. They are transferred from person to person by infected food and drink; generally, of course, by means of their eggs.

The *round stomach worm* (Ascaris lumbricoides) inhabits the upper bowel, and is even vomited up through the stomach. The male measures 15 to 17 cm., and the female 20 to 25 cm. They look like earthworms. Bad digestion, nose itching, poor appetite, grinding of the teeth in sleep, and even colic are the symptoms of the

presence of this parasite. Even convulsions occur. The diagnosis is made by finding the worm in the stools. It is brought away by calomel and santonin in divided doses. It requires no intermediate host and, therefore, passes from person to person in food and drink infected with the eggs.

The *tapeworms* are long, flat, segmented worms carrying both male and female sexual organs and lacking a digestive tract. The head or scolex carries suckers and in some varieties encircling hooks. Unless the head be removed the worm may continue its life and growth by budding. Each segment carries sexual organs placed along the borders in the Tænia and in the median line in the Bothriocephalus. The number of eggs is enormous and they may show a developed embryo.

Fig. 35.—Head of Tænia solium.

Fig. 36.—Head of Tænia saginata.

There are three forms of *tapeworm* (cestodes) to be reckoned with. The most common is the *Tænia saginata*, or *mediocanellata*, which finds the intermediate host in beef. This worm produces segments measuring from 17 to 18 mm. by 8 to 10 mm., and may reach a length of 25 to 30 feet. The *Tænia solium* is developed by the hog. Its length reaches about 12 feet and its segments are smaller (10 mm. by 7 to 8 mm.). The embryonic worm can pass into the tissues and there produce cysts. The *Bothriocephalus latus* is found in fish. It reaches a length of 25 feet. It is rare in America.

The symptoms produced by tapeworms are craving

hunger (accompanied, however, by a sense of fulness), nervous reflexes, etc. There is usually some anemia caused by the loss of blood, which, of course, produces symptoms of its own. The diagnosis is made by finding the eggs and segments in the stools. To find the segments the easiest way is to pour the suspected stool into a sieve, and then run water through until all the soluble matter passes through. The segments look like macaroni. The treatment includes dieting the patient and then giving extract of male fern or similar teniafuge with cathartics.

The *Tænia echinococcus* is found also in dogs. The adult worm measures $2\frac{1}{2}$ to 6 mm. in length, and is made of three or four segments. In man the eggs are hatched in the intestinal canal and the embryos pass through the walls into the various organs, chiefly, however, to the liver. Here they become encysted (the encysted worms are then known under the term "cysticercus"), and develop more cysts by budding, thus gradually developing a large tumor. There is in the cyst besides the embryo also much fluid. These cysts may endure for years or burst or perforate the capsule of the organ in which they lie buried. Therefore, fluctuating cysts in and about the liver are suggestive of the echinococcus when found in persons who have had much to do with dogs. The symptoms are those due to a tumor in the organ infected. The treatment for perforation, etc., is, of course, surgical.

"Procedure for Removing Worm.—*Preparation of the Patient.*—The patient should not have luncheon or supper the day preceding treatment; black coffee or tea and water may be taken freely. At 6 P. M., from 15 to 30 gm. of magnesium sulphate is administered, and at 6 A. M. the same dose is again administered.

"*Administration of the Drug.*—The patient is not given breakfast, and after the bowels have moved, 30 c.c. of the following emulsion is administered: oleoresin of aspidium, 6 c.c. or gm.; powdered acacia, 8 gm.; distilled

water sufficient to make 60 c.c. One hour later, a second 30 c.c. of emulsion of aspidium is administered. Two hours later 30 gm. of magnesium sulphate is administered; two hours after this a large soap-suds enema is given. The patient then passes the stool into a container, which is sent, together with the stool passed before the administration of the drug, to the laboratory. He is cautioned not to put toilet paper into the specimen.

"*Search for the Worm Head.*—If the patient has been properly prepared, the stool will consist of practically nothing but water, a few shreds of digested food, and the worm. The top half of the stool, which usually consists of about 2 quarts of water, may be poured off, and the rest of it is poured through a sieve with a 20-mesh bottom. Warm tap water is now run through the sieve, and if the procedure is properly carried out the sieve will contain nothing but the worm. The contents of the sieve are now emptied into a flat enamel pan, measuring about 25 by 30 cm., the bottom of which has been painted black with asphalt paint. The sieve is rinsed out into the pan by running water through the bottom. One may then carefully look for the head, using wooden applicators, as shown in the accompanying illustration. If each step has been carefully carried out, the finding of the head will be comparatively simple. The large soap-suds enema given at the end of the treatment is extremely important, for often, when the worm is dislodged, the head breaks off and passes into the colon, where it will remain unless swept out by the large enema. It is also essential to use saline purgatives instead of castor oil, as aspidium is highly toxic and soluble in oil."—Magath-Brown, Jour. Amer. Med. Assoc., May 14, 1927.

Hookworm Disease

The *uncinaria,* or *hookworm,* is abundant in the subtropical countries and in the Southern States, where a large proportion of the poorer people suffer from it. It

measures 7 to 11 mm. in the male and 10 to 18 mm. in the female. This worm does not require an intermediate host, but is found in the soft warm mud, and penetrates the skin of the feet or hands exposed to this mud. Once under the skin it migrates rapidly to the intestines, where it lives on the blood of its host. Its symptoms are, therefore, those of an intense anemia (pernicious anemia), with muddy skin, dull eyes, and general weakness. Its results are often mistaken for laziness. It has been termed, therefore, the true "lazy bug." The eggs pass out with the feces and hatch in the mud and are then ready to infect another host. The diagnosis is made by finding these eggs in the stool by microscopic examination. The treatment consists in giving heavy doses of thymol or chenopodium, and then by treating the anemia.

Extent and Effect.—In the United States the disease is found throughout the states south of the Potomac and Ohio Rivers; in Arkansas, Missouri, Oklahoma, and Texas, and also in California. Its prevalence and severity vary widely within a state and even a county, in some localities less than 1 per cent. of the people being infected, and in others more than 90 per cent. Generally speaking, the heaviest infection is found on the light, sandy soil of the coastal plains; the lightest infection on the stiff, clay soil of the Piedmont region, and as intermediate infection among the foothills and mountains. It is peculiarly a disease of the agricultural districts, which goes far to explain the long puzzling lack of physical and intellectual vigor to be noted among large classes of people in what ought to be one of the healthiest and most prosperous sections of the country. Examination of more than 496,000 school children during the five years 1910–14 in 488 counties of the eleven Southern States has shown 40 per cent. of them infected. Of more than 892,000 persons of all ages taken at random in this same territory, 34 per cent. were found to be suffering from this disease, and in a vast majority of cases were completely cured.

"The hookworm is an intestinal parasite—a worm about $\frac{1}{3}$ inch long when it is grown. When of microscopic size it enters the body most often through the skin, generally through the skin of the feet, because the feet come in contact with it in polluted soil. The female worms in the body give forth an incredible number of eggs, which hatch when deposited on the soil, and while still invisible to the eye enter the feet. Thence they make a long journey through the body till they reach the small intestine, to which they cling and give forth a poison which produces the disease, and lay more eggs, and thus repeat the endless round of their parasitical life. As many as 4500 worms have been expelled from a single person; they have been known to live in a person for ten years; and they are so prolific that a large part of the inhabited soil of the earth between 36 degrees north latitude and 30 degrees south is polluted with them. The pollution occurs, of course, because of the insanitary disposition of human excrement" (W. H. Page).

Treatment.—The treatment of hookworm disease is a simple matter. Epsom salts and thymol or chenopodium are the drugs used. The object desired is to clean the mucus and food particles from the intestinal tract, so that the worms will be exposed to the action of the drug. This is accomplished by the administration at night of a dose of Epsom salts. Ordinarily Saturday night is preferred, as it will then cause no loss of time. In treating school children and the children of parents who work out by the day the parents will be at home on Sundays. Sunday morning, at 6 A. M., one-half of the total dose of thymol or chenopodium in capsules is given; at 8 o'clock the other half is given, and at 10 A. M. a second dose of Epsom salts is taken. Having cleaned away the mucus from around the worms, the thymol or chenopodium acts directly on them as a poison. While poisoned, the second dose of salts sweeps them out of the bowels before enough of the drug may be absorbed by the patient to cause undesirable symptoms.

Prophylaxis.—"Hookworm disease, like typhoid fever, is due to careless disposal of human excreta. Once schools and dwellings in country districts are provided with sanitary privies of one type or another, there will be little danger from hookworm.

"A study of the hookworm problem has shown not only the need for sanitary privies, but the need for more adequate sanitary supervision by competent medical officers. There should be in every county or community unit a capable superintendent of health, devoting his whole time to public health work.

"Frequent and systematic instruction by the public schools in the elements of personal and community hygiene is necessary for permanent control of disease. When the citizens of a community are taught from early childhood the necessity for the care of health, they will need no urging to provide expert health supervision and sanitary privies in every community" (Ferrell).

Trichinosis

The hog gives us not only the Tænia solium but also the *trichina*, which measure 3 to 4 mm. in the female and 1 to 2 mm. in the male. The worm lies coiled up in the muscles of the hog. When this is eaten and the capsule digested by the fluids of the human intestine, the worm is set free and in about a week develops a brood of embryos which are discharged into the lymph-spaces. Thence they pass into the muscles and become encysted. If there are only a few, there seems to be small danger to life, and the cysts may remain intact but viable for as long as twenty-five years. If, however, there are multitudes of the embryos, there is fever (102° to 104° F.) of the irregular type, pain in the muscles, edema, etc. The duration of a light attack is ten to fourteen days; in the worst cases death occurs in from the second to the sixth week. The only effective treatment is that instituted immediately after eating the pork. At that time purges and intestinal

antiseptics and vermifuges will be found effective. If nothing is done until the fever breaks out, all we can do is to support the patient's strength until the cysts become complete and quiet. Thorough cooking destroys the trichinæ. Hence, uncooked pork should never be eaten.

The larvæ require about seventy-two hours of residence in the intestine to become sexually mature, and at the end of the week each female may have discharged into the lymph spaces or blood-stream several hundred embryos. In due course of time these pass into the muscle-fibers, in which they create a reactive inflammation and become encapsulated. They may or may not live so for years. In man the appearance of these capsules is that of an opaque, boat-shaped body owing to the late calcification.

Diagnosis.—Assuming that a sufficient number of trichinæ have been ingested, symptoms appear in about one week and are usually characterized by the conjunction of acute gastro-intestinal disturbance and fever, usually remittent or intermittent, followed by muscular pains and tenderness, limitation of movement, edema of the face, extremities, and surface over the infected area, and a marked leukocytosis in which the eosinophils often reach 50 to 70 per cent. of the total leukocytes. The attention should be fixed on the muscle symptoms, the swelling of the eyelids, and eosinophilia.

Mortality.—As the case may assume the typhoidal form, be complicated by albuminuria, pleurisy, pneumonia, dysphagia, etc., the mortality varies from 2 to 30 per cent.

CHAPTER XX

ARTHRITIS OR RHEUMATISM

Rheumatism is a popular term, more comprehensive and definite. It is of public health importance in that the diseases comprised under the term "rheumatism" are apt to leave the patient crippled and unable to earn a livelihood. It is a disorder which has much to do with filling our almhouses and slums with their inhabitance.

It has also an actual mortality. Thus, from the Census Bureau, we learn that in 1910 6.2 per 100,000 was the death-rate for acute articular rheumatism. In 1920 it was 3.8; in 1925 it was 4. The chronic forms of rheumatism and gout showed a rate of about one-third that of the acute diseases.

It is still a moot question as to whether rheumatism is an infectious disease or not. But it does seem certain that the disease called acute rheumatic fever is of infectious origin and, therefore, to some extent, communicable. Some of the subacute and chronic conditions comprehended under the term "rheumatism or arthritis," seem to be due to the secondary result of localized infections. These are the so-called focal infections, which are found in tonsils, teeth, sinuses, gall-bladder, etc. The organisms causing these abscesses may not have been actually the organisms which infect the joints, but they do seem to influence the metabolism of the body in such a way that the circulation in the joints is impaired, and the building up or repair of bone tissue seems upset. The French speak of a diathesis or constitution favoring arthritis, and late studies in this country tend to show that the people who are subject to arthritis have a poor type of circulation, a type which tends to slow up in and about the joints

and cartilages. Then again with this group of people it seems to be proved that there is a lowered tolerance for sugars, and arthritics seem to improve under a restricted diet. To this extent then arthritis is a constitutional as well as an infectious disease.

Under rheumatism, therefore, we have to consider several distinct disorders, such as the acute rheumatic fever, then also various joint disorders, such as septic joints (or infected joints), chronic rheumatism, rheumatoid arthritis or arthritis deformans, as well as myalgia and other types of muscular rheumatism.

Acute Rheumatic Fever

Acute rheumatic fever is a continuous fever of days' or weeks' duration, accompanied by swollen and painful joints. Several joints are usually involved, but those most generally involved are the larger joints—the elbows, the hips, the ankles, the shoulders. Not all these joints are involved at once. Usually the disease begins in one and passes to others. The first may subside and the others develop, or several may be inflamed at the same time. The belief is growing that the heart muscle is always involved, and that this is even more the real site of the inflammation than are the joints. Every patient suffering from acute rheumatic fever should therefore be regarded as a cardiac case.

Etiology.—The disease is probably of microbic origin and the usual portal of entry seems to be through the nose and throat, particularly the tonsils. Tonsillitis precedes this disease in probably 60 per cent. of the cases. It is so difficult to secure a blood-culture in this disease that there is not yet a unity of opinion as to which forms of bacteria are the etiologic causes. Although the joints may be swollen and tender and show evidences of extreme inflammation, yet, after the passage of the disease, they are restored to normal and leave practically no trace. The synovial sacs in the joints are the seat of the swelling

and the joint cavities are filled usually with a clear, non-purulent fluid.

Course.—The disease usually begins suddenly and the pain and the fever are coincident. The temperature ranges about 102° F., the pulse is rapid and irregular. The patient sweats freely and sometimes the sweat is sour and unpleasant in odor. The tongue is coated. The appetite is lost. The bowels are constipated. The urine is concentrated and scanty. The blood becomes anemic so promptly as to make this a symptom of the disorder. The joints are so tender and inflamed that the slightest touch is painful. A jarring or any similar disturbance of the bed causes pain.

The length of the fever is irregular. It may vary from days to weeks and is apt to end as suddenly as it began. But the dangers from the disease are from the sequelæ, and the most frequent of these is heart disease, or endocarditis. This means that the valves of the heart (more especially the mitral valve leading into the left ventricle) become so diseased that they do not function properly and the heart leaks. Pericarditis is also common and causes shortness of breath and other symptoms of a badly functioning heart.

Perhaps the most frequent complication in children is St. Vitus' dance, or chorea. But there are also nephritis, that is, kidney disease, delirium, convulsions, and even meningitis to be thought of as results of this disorder.

Treatment.—The most important things in the treatment are warmth and rest. That is, the temperature of the room should be kept even and warm; and the patient must be so placed in bed that he is absolutely relaxed and the inflamed joints supported by warm sandbags or other means of keeping them quiet and warm.

Diet.—The diet consists largely of milk and vegetables, although the patient is fed as well as his stomach will permit. In choosing milk and vegetables as the chief articles of diet one is guided by the desire to keep all

foods with an acid ash away from the patient because of the acidosis of the body in this disease.

The *medicinal* treatment calls for the local application of salicyclic acid in the form of the oil of wintergreen or methyl salicylate, the use of the salicylates internally in heavy doses (and only for a very short time), and finally, the use of some sort of vaccination which will rouse the body's resistance to help throw off the infection.

Septic Arthritis

One or more joints may be inflamed secondarily to some focal infection somewhere in the body, as, for example, in the teeth, tonsils, sinus, gall-bladder, etc. Sometimes the joints attacked are multiple, sometimes single. For example, after gonorrhea the joint trouble is usually monarticular, that is, confined to one joint, in which there is much pain and considerable fever. After endocarditis several joints are usually attacked.

Such headway has this theory of focal infection made that nowadays whenever we find rheumatism we at once begin a hunt for the foci of infection and sometimes, indeed, may go too far in sacrificing teeth and other tissue in order to free ourselves from even the possibility of focal infections. But the principle seems to be established and it is wise in all cases of arthritis to find the portal of entry, or as we now say—the focus of infection.

In these infections there is apt to be not only the swelling and inflammation of the joints but also a purulent fluid in the joints—as contrasted with the joints in acute rheumatic fever where there is no pus present. This type of inflammation more so than acute rheumatic fever has the tendency to leave the joints impaired and even ankylosed.

We may have arthritis also from tuberculosis, scarlet fever, influenza, syphilis, typhoid fever, and similar communicable diseases. The arthritis from these diseases varies in severity, and seems to be worse when the original

focus remains in the body to keep it sensitized to the particular germs involved.

The *treatment* in this type of disorder demands sometimes the incision and drainage of the joints, but, at any rate, rest and care. The joints should be placed in such position that it will least incommode the patient in case the joints become stiffened. In tuberculosis this is particularly important, for ankylosis, or stiffness of the joints, is in that disease the rule rather than the exception.

Aside from the local treatment, the general treatment calls for the use of the vaccine therapy, either the specific vaccine of the organism found in the tissues, or a non-specific protein vaccination to rouse the general immunizing powers of the body. Then also tonics, good food, fresh air, rest, sometimes a change of climate are all to be considered and utilized.

Chronic Arthritis

Chronic arthritis is usually without fever and the symptoms are sometimes confined to the inflammation of the tendon-sheaths. There seems to be no formation of pus, but the disorder is exceedingly obstinate and uncomfortable. In this disorder we think particularly of focal infection. And the first aim in treatment is to rid the body of such foci. It is usually a consequence of acute rheumatic fever.

It is this disorder that secures the best results after the foci have been removed by attendance at resorts where baths and mineral springs, the hot-air cabinets, the electric-light cabinets, and other means of producing hyperemia and stimulation of the blood-making organs are in use.

Arthritis Deformans

Arthritis deformans is also called rheumatoid arthritis. It differs from the diseases just considered in that it attacks chiefly the small joints.

Sometimes the joints are deprived of their lime salts and become thin and weak; in other cases there seems to be an increase in the tissue and we have bumps—sometimes hard, sometimes soft—around the joints. This roughening of the joints makes movement almost impossible. For example, when the vertebræ are attacked, it makes of the vertebral column one stiff bone. This is the condition called "poker-back."

There is no fever. The pain is not as great as that of acute arthritis, nor is the tenderness as marked. Women are more often attacked than men, and the age most susceptible seems to be between thirty and fifty. The patients become anemic, weakened, and generally crippled.

Some authorities would differentiate the names used for this general disease. Thus Matthew, of Edinburgh, would make of rheumatoid arthritis a distinct entity in which the disease starts in the nourishment (or lack of nourishment) of the muscles and wherein the joints are only secondarily involved. Arthritis deformans would then be form of the disease in which the bones are attacked primarily. But until we know more about the nature of the disorder it is idle to make fine differentiations.

The *treatment* calls for the search of the body for all sources of infection and irritation. Second, the utilization of all the tonic and stimulant treatment possible. Third, usually a change of climate or at least a prolonged visit at some "hot springs" or other place where baths and waters may be taken in proper form.

Muscular Rheumatism

Muscular rheumatism is also called myalgia. Its most usual forms are lumbago, where it attacks the muscles of the back, and wryneck or torticollis when it attacks the muscles of the neck.

The disease process has not been worked out to a scientific certainty, but the probabilities are that the pains are due to the deposit in the muscular tissue of waste

products. Consequently, this disease appears in those who are exhausted or who do not keep their muscles in proper tone, or, again, whose bowels are so constipated that there comes to be an absorption of the by-products of digestion from the denuded mucous membrane of the bowel.

We find these lame backs also in people who have jobs that keep them occupied seven days a week and twenty-four hours a day. For those people no relief can be found unless they can secure some relief from the monotony of life. The habits, therefore, of taking long vacations should be advocated and also the habit of taking a noon-day rest should be enthusiastically supported. In other words, the tendency in America of concentrating and working at high speed for months and years is to be condemned. And there should be substituted for it a more leisurely form of life which does not destroy the body. If this change of life is brought about there will be less need of discussing the diet or of the setting-up exercises that sedentary workers should follow when attacked by muscular rheumatism.

CHAPTER XXI

BLOOD-POISONING AND ERYSIPELAS

Blood-poisoning

Blood-poisoning is a popular term that covers several pathologic conditions. In general, there are three types: septicemia, toxemia, and pyemia.

A septicemia is an infection of the blood-stream by some pathogenic organism, such as the streptococcus or pneumococcus. Entrance is obtained usually through some wound or abrasion of the skin, although the condition may result from the breaking down or extension of an abscess in some internal organ.

A toxemia is the poisoning of the body by the toxins liberated by some abscess or infection. It differs from a septicemia in that the micro-organisms themselves are not loose in the blood-stream, but only their toxic products. Thus diphtheria and tetanus are examples of toxemia. In other words, some germs manufacture poisons which when absorbed by the blood-stream act as chemical poisons, while others are dangerous chiefly through their presence and growth.

A pyemia is really an extension of a septicemia to the extent that secondary abscesses are formed in many different places in the body. Thus cases of phlebitis are usually pyemias.

Blood-poisoning usually manifests itself by fever, malaise, indigestion, etc., as well as by the pain at the point of infection. The fever in abscesses is usually of the remittent type. That is, the temperature is normal (or subnormal) in the morning and rises to 100° or 101° F. in the afternoon. When the temperature drops in the

night the patient may break out in a sweat. The malaise may consist of headaches, backaches, weakness, and nervousness. The indigestion is shown by the lack of appetite, the coated tongue, and even by nausea and vomiting.

The most common form of blood-poisoning is that which follows the receipt of an infected wound. Thus in case of an infected wound of the hand or arm, one may see the redness and swelling about the wound extend in all directions, and then a red line begin to travel up the arm (along the lymphatic channels) until it reaches the glands of the armpit. These glands swell and become sore, and soon afterward the signs of the generalized infection appear.

The outcome of such an infection depends first upon the virulence of the causative organisms; and second, upon the resistance of the body. For if the organism be a virulent streptococcus the outlook is worse than if it be a less virulent staphylococcus. Then, too, the condition of the body influences the outcome in that a strong and healthy body will present greater resistance than a weak and exhausted one.

The **prophylaxis** of blood-poisoning, therefore, calls for the thorough cleansing and sterilization of all wounds and abrasions. Such cleansing usually means the washing out of the wound with plenty of hot water, and the application of antiseptic solutions. Of the latter the tincture of iodin is deservedly popular. In its absence phenolated camphor, turpentine, or even hydrogen peroxid may be used. The further treatment depends so much upon the nature and extent of the wound that no general rules can be given.

The **treatment** of blood-poisoning calls first for rest. The body itself as well as the part originally infected needs to be kept quiet and warm. Next the heart and circulation have to be supported or stimulated by appropriate stimulants or tonics. And third, antiseptics or

serums may be used to discourage the growth of the bacteria or to neutralize their toxins.

During this time the patient is given plenty of water, and simple nourishing food. The bowels should be kept open with gentle cathartics, such as calomel and the salines.

As examples of other types of blood-poisoning one might call attention to carbuncles. These are exaggerated furuncles or boils. For whereas boils are infections of the skin with one large focus, carbuncles consist of several boils so close together that they may be considered as one with several compartments. Such carbuncles are fortunately rarely caused by very virulent organisms. They owe their seriousness to the low vitality of the patient (for example, they are common among diabetics). The treatment consists, therefore, not only in opening and draining the abscesses but also in stimulating in every way the patient's vitality.

Similarly, when one sees crops of boils developing in a patient, one realizes that the patient must be stimulated and toned up to develop an immunity to those germs. The mere opening and cleansing of the boils rarely check the development of new ones unless the patient's immunity has been raised.

Erysipelas

That erysipelas does cause death is shown by the fact that in the Census Reports for 1925 erysipelas is credited with 2.4 deaths per 100,000. In former days this disease was greatly dreaded in the hospitals. For example, in the Franco-Prussian War it was erysipelas that made the work of the surgeon practically of no avail. But since the days of asepsis and antisepsis the percentage of deaths from erysipelas has been greatly decreased, and it is no longer dreaded as it used to be in cases undergoing surgical treatment. But even now the appearance of erysipelas in a hospital is looked upon with considerable alarm and

rigorous precautions have to be taken to prevent its spread. Fortunately, this prevention is rather easy because the disease is transmitted only when there is abraded or wounded skin.

It is then an acute infectious disease caused by the infection of an abrasion of the skin with the Streptococcus pyogenes. It will be remembered that the streptococcus is that large group of bacteria the members of which cause such diseases as pneumonia, rheumatism, endocarditis, and abscesses in general. The streptococcus of erysipelas cannot enter the body except through the broken skin or mucous membrane. Consequently, the disease is found among those people who scratch their skin with dirty finger-nails, as gardeners, and workers in the soil. It used to be prevalent also among surgical cases and in the newborn. Thus, erysipelas is one of the dangers of childbirth both for the mother and child. In the latter case, which, by the way, is exceedingly dangerous, it usually attacks the navel, in contrast with the ordinary type of erysipelas, which is that of the face.

The incubation period varies from three to seven days.

The onset is usually with chills and fever. The temperature is usually high and remains high for four or five days and then falls either by crisis or by lysis.

The local symptoms are the reddening, thickening, raising, and heating of the skin. The usual location is the face, beginning at the bridge of the nose and spreading down on either side. When this is symmetric, it looks like a butterfly.

For patients under forty the mortality is very low; but for those above forty it is increasingly fatal with the years. The average mortality is 4 to 7 per cent. This must, however, be interpreted in the light of the above statement—that the disease in patients above forty is often fatal, and for those under forty usually light.

Death is usually brought about by the germs breaking into the blood-stream and reaching the heart, liver,

lungs, and other organs, and there forming colonies which weaken these organs, or by excreting sufficient toxins to poison the entire organism, that is, producing septicemia or pyemia (q. v.). Again, even in cases which show only slight fever, but are very obstinate, where the germs do not get into the blood in great numbers, the disease may be fatal because it exhausts the patient with the length of its course, which may be as long as two or three months.

Treatment.—The disease is very contagious, and, therefore, everything that comes in contact with the patient should be carefully sterilized before being used again by other people. One of the chief dangers of this disease is the fact that very few people realize this contagiousness and permit the patient to pass freely about the house, handle all sorts of articles, breathe into the faces of the family, and eat at the table with them. None of these things should be permitted. Only one person should take care of the sick person, and she should always change her clothing before mingling with the rest of the family. She should bathe her hands in an antiseptic solution, such as the solution of the cresols (liquor cresolis compositus), or corrosive sublimate (mercury) before and after dressing the patient's eruptions or abscesses. There is special danger when women about to be confined have erysipelas; and, in fact, the worst forms of childbed fever have been traced to cases of erysipelas in the house or under the charge of the nurses or doctors who attended such women.

In view of what we have said, it is evident that erysipelas should always be put under the care of a physician, and his directions carefully followed as to treatment, isolation, and disinfection. If abscesses appear, they should at once be opened and cleansed once or twice a day with phenolated camphor or similar antiseptics. In the form which comes from tonsillitis, one should be on the watch for such abscesses in the back of the throat and nose and about the palate. The patient should, of course, be given

a sponge bath once or twice a day according to the height of the fever. Here, again, it is well to use an oil rub to keep the particles of desquamated skin and the germs from flying about in the air. The most gratefully received treatment for the disease is the protection of the inflamed surfaces from the access of air. This can be done by rubbing on a thick coat of vaselin or similar substance. In many cases the use of antistreptococcic serum seems to shorten the attack.

The diet must be as nourishing as possible. Whether or not it should be fluid depends on the height of the fever and the state of the digestive apparatus. The so-called starvation diet is decidedly out of place, and rich broths, milk, fruit juices, etc., should be served every three hours or as often as the patient can take care of them.

CHAPTER XXII

TRACHOMA

Trachoma is also called "granulated lids" and "sore eyes." It is communicable by means of virus carried from infected to healthy eyes. It is such a frequent cause of blindness that immigrants with this disease are forbidden to enter the United States.

It is most frequently communicated by the use of common towels, handkerchiefs, and bedclothes. The use of the same towel by more than one person is the easiest way to convey the infection, and undoubtedly more cases of granulated lids among the mountain people of Kentucky where the disease is very prevalent are caused by the common family towel than by any other source of infection. Children at school may also convey the disease to others by exchanging or using the same pencils, slates, and cloths, or in playing games by blindfolding with cloths, fingers, etc.

As the disease feels like a cinder in the eye, a friend may try to remove it and neglect to wash his hands before rubbing his own eyes. In fact, the disease can be contracted in any manner that carries infected discharges from a diseased to a healthy eye.

Symptoms.—When trachoma begins the eye feels as though a cinder, corn-silks, sand, dirt, sawdust, or other substance had gotten into it; and usually some of these things are blamed for the eyes getting sore. The eyes soon become red and painful and discharge water. Some pus is present and the eyelashes stick together in the morning. Soon the daylight affects the eyes and in time causes so much pain that it is necessary to wear dark

glasses or to tie a dark cloth over the head in the effort to keep out the light. The inner surface of the eyelids becomes rough somewhat like sandpaper and irritates the eyeball during every wink of the eye. This causes ulcers on the eyeball and the scar tissue over the cornea causes the patient gradually to become blind. While the redness, pain, and discharge may cease for a time, the disease is almost sure to return unless treated, each attack damaging the eye more and more.

The **cause of the disease** has not yet been determined with certainty.

The corneal scar tissue may develop after a year's course of the disease. The restoration of the eye to complete normal can hardly be hoped for even with good treatment.

The essence of the disease is the formation of granules, first upon the conjunctiva of the lid and then in the other folds of the conjunctival tissue.

The differential diagnosis is very different because one has to distinguish it from vernal catarrh, various types of follicular conjunctivitis, beginning tuberculosis, etc. Sometimes only a consultation of specialists is sufficient to determine the diagnosis.

Prophylaxis.—The prophylaxis demands that children affected with this disease be segregated and sent to separate schools and that adults with the disease must be taught to protect others from the infection and to take definite interest in having their own eyes treated.

Prophylaxis also demands that school-rooms be provided with towels and soap, etc., in sufficient quantities so that individuals may have their own supply.

Treatment.—Patients suffering with trachoma need to be taught also to wash their hands in antiseptic solutions or at least use some of the antiseptic soaps, such as the newer mercurial ones. The local treatment is by means of caustics and astringents. The squeezing out of the granules is also employed.

The general condition or constitutional condition of the children affected with this disease is to be looked after very thoroughly. The rooms in which they live must be plentifully supplied with fresh air. The food must be of the stimulant type and it is generally wise to treat them with cod-liver oil and other tonics.

PART II

SYSTEMIC DISEASES

Under this heading we plan to group those diseases which are characterized more by their effect upon the individual tissue or organ than by their ready communicability. We might call them degenerative diseases. For example, we have diabetes, a disease of the pancreas; we have endocarditis, a disease of the heart, both of which might have been caused originally by some germ infection; but after the damage has once been done the disease is not communicable, nor does it present ordinarily the self-limited course of most infectious diseases, but rather emphasizes the damage done to the organs.

As a group their onset is on toward middle life, while the communicable diseases attack the younger generations. This emphasizes the need of frequent physical examinations as we grow older.

We might call them organic diseases—if we do not misinterpret the word organic. But since "organic" is used elsewhere in this book as a contrasting word to "functional," it has seemed wise to use "systemic" as the general heading for this section.

CHAPTER XXIII

DISEASES OF THE RESPIRATORY TRACT

In the Census Reports for 1925 we find that respiratory diseases aside from pneumonia and bronchitis are credited with 8875 deaths. This would give a rate of 8.6 per 100,000.

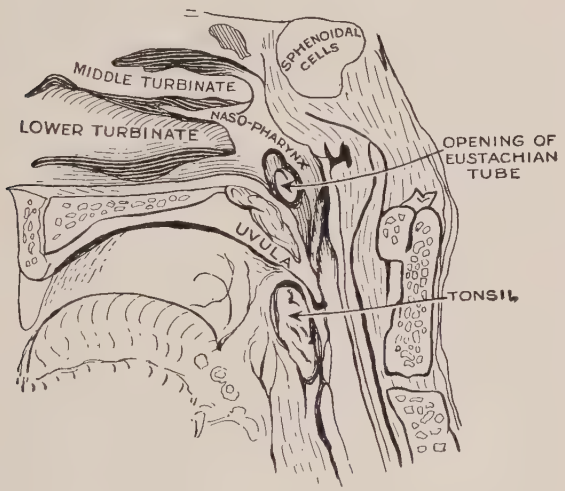

Fig. 37.—Diagram of the nasopharynx.

Because of their exposed positions the nose and throat are especially susceptible to disease from the irritation of the dust and dirt in the air, from the frequent changes in temperature, as well as from infections, such as those which have been described under the heading Communicable Diseases. The result of such irritation is a chronic inflammation. This may be of two forms, either

the tissues may be thickened, or they may degenerate. The first is called hypertrophy or hyperplasia; and the second is called atrophy. In either case the laity is apt to call such disorders catarrh because of the increase or changed excretion from the nose and throat. Thus, we have scabs formed inside the nose, we have a discharge that is coughed out or blown out in the morning or on any exertion sufficient to cause an increased flow of blood and increased respiration. In the hypertrophic type the increased congestion of the blood may lead to a thickening of the mucous membrane and even of the bones, and thus result in an obstruction of the nose. This might be called hypertrophic rhinitis.

Its treatment calls, first of all, for the removal of the irritation, *i. e.*, getting away from the dust and dirt that causes the inflammation. Second, the membrane should be kept soothed by vapors, medicated with camphors, balsam, or by oils that protect them from the drying influence of the air that passes over the surface. Frequently physicians wash out the passages of the nose and throat with silver albuminate or other aqueous solutions. They then follow such treatment with the application of soothing oils or vapors.

The cities are now so full of smoke and dust that one should think of the nose in the same way that one thinks of the mouth and teeth, *i. e.*, there should be frequent cleansing of these passages to rid them of the accumulation of débris. For this purpose the use of atomizers and sprays seems to be quite satisfactory.

From the public health standpoint it is worth an effort to stop the smoke nuisance in the cities by using smoke consumers and to try to keep the streets of the cities free from dust and dirt by frequent sweepings and washings. Then, too, in the homes it is well to avoid the overheated rooms and dried-out air by using thermometers and heat regulators as well as by adding moisture to the air that is being poured into the rooms.

Recent experiments in school buildings have demon-

strated that those children are freer from coughs and colds who work in rooms that are ventilated by open windows rather than by any system of forced drafts or superheated air, or any system whereby the air is cooked before being sent to the children. The best temperature for such children seems to be around about 60° F., *i. e.*, from 58° to 62° F. The children also work better mentally as well as physically in such temperatures.

Coughs and Colds.—The nurse even more than the physician has the opportunity to instil into the minds of the members of the families in which she is employed the principles of preventive medicine. She can, therefore, if she be observant of her opportunities, do much toward educating the public in medicine and toward promoting the public health. In no one particular can she accomplish more good than by teaching the people to breathe pure air, to breathe deeply, and to invigorate the skin by the use of daily cold-water baths. These simple expedients would prevent the greater part of the coughs and colds now afflicting the average American family.

Colds.—The ordinary cold (coryza) is due to a congestion of the blood in the mucous membrane of the nose and throat. This congestion is often induced by inhaling the fumes of some irritating gas, such as chlorin or sulphur. It may be induced by the reaction from a local chill to these surfaces, such as is obtained by being exposed to a draft of cold air. It may also be caused by the irritation of dust and smoke. Finally, it may be caused directly by bacterial infection. Of course, even if the original cause be mechanical or physical, nevertheless the congestion results very soon in an infection, because the membranes of the nose and throat are always covered with bacteria deposited there by the air passing to the lungs; and these bacteria need in order to become active only the opportunity presented by the weakening of the bactericidal power of the membrane caused by the congestion.

This congestion is simply the distention of the capil-

laries of the nose with blood. But in tissues so vascular as those of the nose such a dilatation of the capillaries fills up the nasal passage with turgid mucous membrane so that the patient cannot breathe through the nostrils. This congestion also causes the glands in the membranes of the nose to swell and discharge a watery mucus. When the bacteria become active this discharge becomes more or less purulent.

If the turgescence does not at once subside the congestion becomes an inflammation, more or less bacterial in character, and spreads along the mucous membranes downward into the pharynx and throat. This means the development of a "sore throat." The same process upward instead of downward leads to an inflammation of the bony cavities connected with the nose: the antrum of Highmore (*i. e.*, the maxillary sinus), the frontal sinus, and the sphenoidal cavities. This "sinusitis" causes a persistent neuralgia as its chief symptom. The inflammation may even pass into the eustachian tube, and then into the middle ear, and thus cause otitis media and deafness.

Prophylaxis.—The prophylaxis of colds is, then, to keep the skin and mucous membranes healthy, so that when a congestion occurs the membranes quickly recover their balance. This healthy condition of the nasal membranes is secured by sleeping at night with the windows open, by bathing the skin daily in cold water, rather than by tonics and medicines.

When a cold has once begun, by washing out the nasal pasasge with some soothing and antiseptic spray or solution one can sometimes check the development of more than a temporary inconvenience. After cleansing the nose thoroughly the sufferer should go to bed, or take some equally effective means of obtaining quiet for the nasal membranes.

Dwellers in cities where the air is charged with smoke and soot would do wisely to wash out the nostrils at night with either a diluted alkaline antiseptic solution, or a

solution of some camphoraceous body in liquid petrolatum (*e. g.*, "chloretone inhalant"). These may be instilled with a bulb spray or even a strong medicine-dropper. Enough should be instilled to produce a distinct taste in the throat.

Sore Throat.—A cold may, of course, begin in the throat without having extended down from the nose. This usually takes its beginning in a diseased tonsil. Tonsils are even more liable to infection than are the nasal membranes, and are, therefore, the starting-point for many general diseases. From the pharynx the inflammation usually extends downward to the larynx, and we have both sore throat and cough. This cough is nature's effort to throw off the irritating substance from the respiratory passage. The hoarseness is due to the swelling of the finely stretched vocal cords, a swelling that makes their edges thick and soft. If the infection causing the inflammation be not particularly virulent the inflammation will subside in a few days if the cords are given a rest. This cure is hastened if one causes a hyperemia of the throat by applying moist hot bandages to the outside of the neck from the jaw to the collar-bone. To do this take a strip of coarse cloth 4 inches wide and 3 or 4 feet long. Moisten one end in water and wrap that end first around the neck from the root of the neck to the ears, wrapping the dry end around over the moist portion. This keeps the bandage moist and the heat of the body keeps it warm. This should stay on all night or for at least six hours at a time.

CATARRH

Catarrh means an increase in the secretion of a mucous membrane. It is usually limited in the popular mind to cases in which such an increased secretion is chronic and also changed in character so that it is no longer the normal or usual one.

Therefore, we can have catarrh of the nose and throat, of the stomach and bowels, of the vagina and uterus, etc.

Technically, the condition is one of chronic inflammation, and is due to slight irritations continued over a long period of time.

The treatment calls first for a removal of the cause. For this reason the use of patent medicines usually fails to accomplish anything more than to make the manufacturers wealthy. A searching investigation under the guidance of a skilful physician is needed in every case.

Catarrh of the head is, then, a chronic inflammation of the membranes of the nose or of the cavities opening into the nose (antrum of Highmore, nasopharynx, frontal or ethmoidal sinuses, etc.). The causes are usually to be found in an inflammation of these membranes, that on account of poor drainage or constant irritation from dust and smoke, has never been cured. Sometimes the result of the continued inflammation is the thickening and overgrowth of the nasal membranes. This causes a hypertrophy of the glands which lie in this membrane, and there results an increase in the amount and a change in the character of the nasal secretions. In other cases the result of the inflammation is just the opposite, and the membrane is thinned and the secretion lessened—with a consequent dryness that produces an irritating itching. The treatment for such a condition is chiefly local, although any constitutional weakness should be looked after at the same time. That is, the cause of the continued inflammation must be removed by cleansing the cavities and keeping them clean, bony deformities and membranous growths must be removed, and a purer air must be sought out. One sees the worst cases of nasal catarrh in the children of poverty and dirt. These children usually sleep crowded together in small rooms which for fear of cold are kept tightly shut. For fear of the cold also the children are seldom bathed; almost never is there a daily cold bath given, and their skin, hair, and nails are but indexes of the condition of the nasal cavities. The physician sees such cases even in well-to-do families;

but it is a curious fact that such people prefer to dose their children on everything from cod-liver oil to worm medicine—and spend hundreds of dollars in doing it—rather than come down to sleeping with the windows open and taking a daily cold bath.

Chronic Catarrh of the Nose

Chronic catarrh of the nose may lead to the loss of the sense of smell. The worst form of this type of catarrh is called ozena. This is accompanied by a most disagreeable stench from the breath of the patient. It is due to a mixed infection, although one suspects the presence of spirochetes and sometimes, indeed, the spirochete of syphilis.

Catarrh of the Throat

Catarrh of the throat (chronic pharyngitis) is usually a continuation downward of that of the nose or "head." Once started, it is difficult to cure, and the best results are obtained from moving to a climate where the air is free from dust and smoke; and in cases of atrophic pharyngitis, best to one of considerable humidity; and in the hypertrophic variety, to some high and dry climate. The smoke from the soft-coal burners in our great cities is irritating to inflamed throats; therefore, parents who can rear their children in the purer air of the country should always utilize the opportunity. For those who cannot change their location, soothing and antiseptic gargles will be found helpful. Those who can afford it usually pay frequent visits to the laryngologists and have their throats sprayed and irrigated.

Nosebleed

Nosebleed, or epistaxis, is fairly common and is a symptom of widely different disorders. It may be due, for example, to an ulcer in the nose itself. It may be due,

again, to some beginning general disease, such as typhoid fever. Or it may be the result of high blood-pressure. One sees also stages of leukemia and similar disorders where there is bleeding from the nose.

Emergency treatment may be given by pushing into the bleeding nostril a pledget of cotton saturated with adrenalin or some astringent solution. An effective way for extreme cases is to pass a rubber catheter through the nose and down into the throat and out through the mouth, thread the catheter with the string attached to a pledget of cotton or tampon, and then pull the thread up through the throat and nasopharynx until it plugs the nares and thus shuts off the bleeding.

Repeated hemorrhages of the nose call for careful examination not only of the nose and throat but also of the blood, the urine, and the rest of the body.

Hay-fever

Hay-fever has the symptoms of acute coryza. The nose runs, the eyes water, the patient sneezes almost constantly. The attacks come at definite seasons and last for days. It is due to the sensitization of the membranes of the nose to certain pollens, especially those of spring and fall ragweeds which overwhelm the normal defenses or digestant powers of the mucous membranes and result in a lowering of the resistance of the body, in fact, in a poisoning of the entire body, so that it is especially sensitive to such proteins.

Prophylaxis.—Prophylaxis demands that ragweed and similar pollen-bearing plants be cut down in the vacant lots and along the fences and roadways. This alone would save sensitized persons much suffering and save others from becoming sensitized.

Then attention should be given to keeping the air of our cities as free as possible from dust and smoke.

For the susceptible person a trip to some part of the

country where such weeds do not grow seems to be necessary during the pollen season.

The desensitization of patients by the use of vaccines is, of course, worth while because a sufficient percentage of cases of relief has already been obtained to demonstrate the soundness of principle. It requires the administration of minute doses of the irritant proteins at weekly intervals before the season of exposure arrives. At present it is wise to repeat the course of treatment yearly until one is sure that he has overcome his susceptibility.

Adenoids

In this connection we should like to mention the overgrowth of the adenoid or glandular tissue in the back of the nose which is specially liable to occur in young children, where it forms a so-called adenoid vegetation. This vegetation practically closes the passages for respiration; and these children because of this congestion of the tissues in and about the front of the brain become mouth-breathers, dullards in school, and even stunted in their development. Whenever, therefore, a child is found to be breathing with difficulty through its nose, or sleeping with its mouth open, a physician should be called to determine if there are such obstructions; and, if he reports that there are, their removal should at once be undertaken.

Hypertrophied Tonsils

The result of frequent sore throats and cold is an enlargement of the tonsils in the pockets between the faucial pillars. Such an enlargement usually means also a degeneration of the tonsillar tissue. In such cases the tonsils are of no use as protectors of the throat. They should then be removed, for in their depths may be developed small abscesses which would generate toxins dangerous to the health of the body.

Croup

Croup may be either a spasmodic contraction of the glottis or larynx or may be due to diphtheria. The latter type has been discussed elsewhere. Here we need mention only the nervous type.

This nervous type is distinguished from the inflammatory ones by the quick relief obtained every now and then by the relaxation of the spasm. Thus the child may struggle for breath until the face becomes blue. But even while we fear suffocation, suddenly the spasm is relieved and the child takes a deep breath and the attack is past.

The **treatment** requires the warming or the relaxation of the tissues. For instance, a hot, wet towel may be wrapped about the child's neck. Or the child may be immersed in a hot tub or bath. Then again ipecac may be given. The inhalation of a little chloroform may be sufficient to relax the spasm in some of these children. It is interesting to note that these children may be perfectly well during the day or at least have only a slight cold. But during the night attacks may come on repeatedly. Such cases, of course, should be studied to ascertain the source of the irritation. Thus inflamed tonsils, obstructed nostrils, and adenoids should be cared for in the daytime and thus relieve the child and the family of the unpleasant nocturnal disturbances.

A croup tent is an important means of treatment of children who are liable to these attacks. This is made by hanging a blanket over a frame in such a way that the entire bed is covered except for small apertures at the side near the head for ventilation. An emergency tent may be formed by using an open umbrella over which a blanket may be thrown. An electric grill is the safest means of heating the water for such a tent. In the lack of electricity one may use an alcohol lamp. A small dish or kettle is filled with boiling water and the compound tincture of benzoin added in the proportion of one tea-

spoonful to the pint. The steam from this kettle should be led underneath the blanket into the tent by means of a long tube or a rolled newspaper funnel.

Edema of the Glottis or Larynx

Edema of the larynx is a swelling of the membranes of the throat, glottis, and larynx to such an extent that the voice is hoarse and even breathing may be obstructed. Sometimes the tongue and lips participate in the edema. In such cases the patient is a pitiful object, with reddened face, swollen lips, protruding tongue, and noisy breathing.

This is a severe and dangerous condition due sometimes to vasomotor or nervous upsets, sometimes to severe inflammations of the throat, as in diphtheria, erysipelas, scarlet fever, etc., sometimes to tuberculosis. But it may also be due to nephritis and sometimes to vasomotor neurosis.

Cases of sudden onset and rapidly fatal termination may occur. But usually it is preceded by a period in which the patient finds it difficult to get his breath (progressive inspiratory dyspnea) with hoarseness or lack of voice. In nephritis, especially the acute nephritis of childern, one should be on the watch for the involvement of the larynx.

Whenever this is found it is essential that something be done of radical nature. The free scarification of the engorged tissues, the application of astringent preparations, and often an emergency tracheotomy may be justified. The nurse should spray adrenalin into the mouth and throat if she finds such a condition, in the absence of the attending physician.

Laryngitis

Hoarseness is due to a paralysis, or an inflammation, or a deformity of the vocal cords. That is, the cords no longer come together smoothly and present a firm surface or edge.

Paralysis may be an accompaniment of goiter or

aneurysm, or the direct effect of a "stroke," or the result of a functional nervous or emotional disorder, such as homesickness.

Deformities are due to tumors and scar tissue. Thus cancers may develop in the larynx. But more frequently the tumors are benign—such as papillomata or warts.

The inflammations are usually extensions downward of inflammations of the pharynx. But sometimes they start in the larynx, as in cases of diphtheria and tuberculosis.

The **treatment** of simple catarrhal laryngitis is, first of all, rest and then the inhalation of fresh air and the administration of soothing vapors, such as have been described under Colds and Bronchitis.

Bronchitis

The result of the continuation downward of a cold is an inflammation of the bronchial tubes. This manifests itself usually in a light fever, a cough, and the expectoration of more or less frothy, clear mucus. When one listens to the chest of such a patient, one hears whistles, rattles, and crackles all over the chest. This, of course, indicates that the mucous membranes of the bronchi are covered with this secretion which interferes more or less with the passage of the air to and from the lungs.

It may be due to infections, bacterial in type, or may be also caused by vasomotor changes, such as chilling, or again to the inhalation of irritant fumes, such as those of chlorin. However, just as in the case of a cold in the head, this mechanical and chemical influence leading to the suffusion of the tissues with mucous secretions present a fertile field for the development of bacteria so that after a day or two practically every case of bronchitis has become a bacterial disease.

Rarely is bronchitis fatal. It is virulent when it leads to the development of a bronchial pneumonia or becomes chronic and then develops into an asthma.

The **treatment** calls for the inhalation of soothing vapors and for rest in an even temperature with fresh

cold air to breathe. The bowels and general skin of the patient should be looked after as well as the other conditions.

The application of pneumonia jackets or of clay poultices is necessary only when one cannot control the movement of the patient or of the temperature of the room or his exposure to changing atmospheres. Under such conditions it is much wiser to apply the protecting jackets

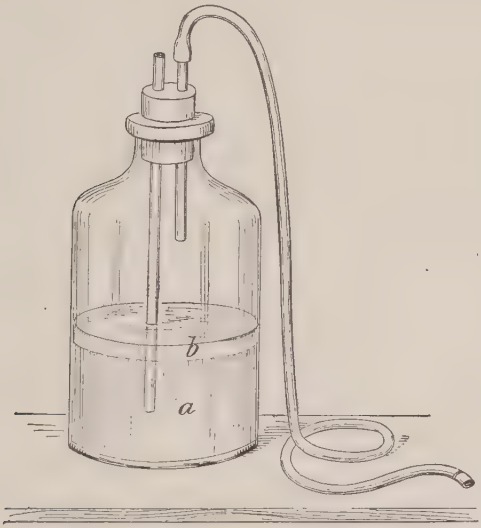

Fig. 38.—The "turpentine pipe": *a*, Water; *b*, turpentine.

rather than to grease up the skin with lard or mentholatum or goose grease, as used to be the custom.

The *care* of a person suffering from bronchitis requires the making of the air of the room moist with the vapor from boiling water in which enough oil of eucalpytus or turpentine (as the doctor may prescribe) has been poured to render its fumes distinctly noticeable. A croup tent will be found useful for giving the patient such inhalations.

When the patient is up and about a "turpentine pipe" (Fig. 38) will be found very effective. He should suck the turpentine-laden air up through the tube for at least ten minutes at a time, several times a day. Next, the air of the sick room must be cool and fresh. This can be obtained from an open window over which is fastened a stout coarse cloth to prevent a draft. Hot and cold fomentations to the chest and back will assist in carrying off the products of the inflammation. The cough is best treated with heroin or some similar drug.

Soothing sprays for the throat in these disorders are made of 1 or 2 per cent. solutions of menthol and thymol in refined petroleum.

It always assists in the establishment of a better circulation to have a good mineral water or cathartic salt given at the beginning of the trouble and usually also (in smaller dose) every morning.

Emphysema

The result of a long-continued cough and "hawking" from a chronic bronchitis is the straining and consequent overdistention of the bronchioles and air vesicles. This produces emphysema. In this disease the chest remains in the position of full inspiration, because the alveoli, having lost their elasticity, cannot expel their air. Hence the patient has to breathe by means of the accessory muscles and the diaphragm—that is, straight up and down. We can recognize such patients by their barrel-shaped chests and the cyanosis, besides the more accurate symptoms elicited by palpation, percussion, and auscultation. The patient suffers all the paroxysms of asthma and similar troubles.

Bronchiectasis

Another frequent result of chronic bronchitis is bronchiectasis, or the ensacculation and breaking down of the wall of the bronchioles. In these sacs great masses of

pus accumulate, to be discharged about twice a day by paroxysmal coughing. In emphysema the cough is more frequent, but also paroxysmal.

Winter cough is a form of chronic bronchitis. So also is the so-called morning cough. In either case the tissues of the bronchi have become so changed that there is a thickening and a hardening of the mucous membrane with the result that there is a large amount of hard tenacious secretion. The mucus thus secreted has to be gotten rid of whenever the opportunity offers. This opportunity usually occurs nights and mornings when the posture of the body as well as the temperature changes.

Putrid bronchitis is a case of chronic bronchitis in which the organisms which have settled on the mucous membranes are of the pus-forming group and produce the peculiar fetid sputum that gives name to the disease. Such patients have usually a destruction of tissue sufficient to form cup-like enlargements along the course of the bronchial tubes. This foul-smelling pus is then collected in these cups and can be discharged only by unusually violent coughing or retching. This, of course, should be brought about at some time every day. The inhalation of creosote preparations or even the rubbing into the skin a solution of guaiacol in olive oil may be of help in some cases.

All such patients should, if possible, live in a climate that is the best adapted to their needs. The temperature should be even, the air should be clear, and either moist or dry according to the nature of their particular inflammation. Thus some do best in the mountains, others near the seashore.

The fibrosis found in these cases goes on increasing from year to year, so that although such patients may reach the sixties, their last years are full of discomfort and weakness.

The tubercle bacilli frequently gain entrance to such weakened tissues and grow slowly. Rarely do such

bacilli succeed in producing a case of progressive consumption, still they do increase the number of foes of the body and shorten its life. Moreover, such cases are frequently the centers of infection for large groups of people who associate with such semi-invalids.

Asthma

Asthma is a popular term needing some definition. It is really only a symptom and may be caused by three, at least, quite different conditions. It may be described as a condition of difficult breathing, wherein the obstruction to the free passage of air lies in the narrowing of the lumen of the smaller bronchioles. The medical term for difficult breathing is "dyspnea." Therefore, asthma may be spoken of as that form of dyspnea wherein the bronchial tubes suffer a spasmodic contraction. The objective symptoms are the cough and wheezing (whistling of the air through the bronchioles). The subjective symptoms are the feeling of suffocation and weight on the chest.

Bronchial asthma is the form attending a bronchitis, or inflammation of the lining membranes of the bronchioles. In this form one can hear the labored breathing and the whistling of the breath several feet away from the sufferer. This form is apt to become chronic and incurable through the changes that take place in the walls of the bronchioles. (See Bronchiectasis and Emphysema.) However, the disease itself rarely causes death. Patients suffering from chronic bronchitis are subject to acute attacks of asthma when exposed to irritant dust and sudden weather changes. The treatment of an attack is usually to burn powders of cubeb, stramonium, potassium nitrate, and similar drugs in the room until the vapors soothe the excited membranes. The hypodermic injection of atropin, gr. 1/100, and morphin, gr. $\frac{1}{8}$, is good emergency treatment. Sometimes steam saturated with oil of eucalyptus, generated as described for throat diseases, is effective. A change of

climate is usually necessary for a cure. Wherever he live, the patient should avoid a neighborhood the air of which is filled with smoke or dust.

Cardiac asthma is the result of the failure of the heart to pump the blood to and from the lungs steadily and rapidly. Its exciting cause is then a stasis of the blood in the lungs, while its primary cause is some form of heart disease. Myocarditis, an affection often undreamed of by the patient, is usually found when an asthma of this type brings the patient to the doctor. Here, of course, relief is given by stimulating the heart; and such symptomatic treatment as the burning of stramonium in the room is out of place. The patient should be put to bed with an ice-bag over the chest. A hypodermic injection of 1/50 gr. of nitroglycerin is good emergency treatment.

Renal asthma is similar to cardiac asthma, but is probably due to the arteriosclerosis accompanying the disease. For the high blood-pressure gradually weakens the heart until it fails under sudden strain, and we have dyspnea.

Reflex asthma is often caused by some disease of the nose. This form is closely allied to hay-fever. A spur of bone or a hypertrophy of the mucous membrane obstructing the free passage of air through the nose is a quite common cause. Usually, therefore, a rhinologist can do much toward curing this form of disease. Relief from an attack can often be obtained by spraying the nose with an oil solution of cocain, chloretone, adrenalin, and similar drugs.

Asthma may be due to the sensitization of the body in the same way that hay-fever is due to the sensitization of the mucous membranes of the nose to pollens and other proteins. Thus, we may have an asthma due to a focal infection in the body somewhere else than in the lungs themselves, and the patient may have all the night symptoms of a severe bronchial asthma. In such cases an effort should be made to find the focal infection and

the type of poisons or bacteria causing the explosions. When this is found a vaccine treatment is sometimes quite effective in desensitizing the patient and relieving him from the asthma. But, in general, asthma occurs only after certain tissue changes have occurred in the finer bronchi, so that a complete cure is rarely obtained. Quick relief in all these cases is usually obtained by inhaling a bit of amyl nitrite, such as may be obtained nowadays in small ampules. The ampule should be broken in a handkerchief and the fumes inhaled. The burning of asthmatic powders secures its results by the presence in these powders of some form of atropin or belladonna or even potassium chlorate.

CHAPTER XXIV

DISEASES OF THE DIGESTIVE TRACT

In 1922 there were 93,884 deaths reported as due to diseases of the digestive tract—a rate of 100.7 per 100,000. In 1923 the figures were 98,050 and 101.1, respectively.

Digestion is the process of breaking down the substances we take into the body for food into their lowest elements. Thus the proteins are broken into amino-acids; the starches are broken down into sugars; the fats are emulsified and thus made possible of resorption in the intestinal tract. The stomach itself does not absorb these food-stuffs. The resorption occurs below the stomach in the small intestine and for some substances in the large intestine.

Digestion is apparently something that the body must learn to do. Thus the newborn babe has the power of breaking down only the mother's milk. When any new food is presented to that child, it must learn to break it down into its elements. It does this by the production of new ferments produced by the digestive organs. Consequently, it is easy to poison a newborn child by giving him new food in quantities too great for his ferments or digestive juices to break down. Therefore, in feeding a child the first requirement is that each new food should be first introduced separately and in such small doses as to develop the power of digestion. Similarly, in older children and even in adults foods are frequently presented in too great quantity or in too great variety for the secretory organs to prepare necessary ferments. And thus there is developed a real poisoning of the body because even good food if introduced into the body tissues or fluids without change acts as a poison or foreign body in the tissues. Thus one can take egg-white and introduce it under the skin and it acts as a poison and produces an

inflammation at the point of entrance. If, for example, we introduce milk, or some such substance, into a vein or even into a muscle, we secure a reaction in the form of chills and fever which goes under the name of "shock." During shock the blood-pressure is lowered, the temperature is lowered, and the whole organism seems to be below normal. In the same way the modern tendency of taking too much sugar and starches in our food has brought about in many cases a real inability to handle sugars. The body has been overwhelmed by the quantity that it is called upon to digest. This produces as much of a disease as if they were really poisonous substances. An illustration of this principle is found in our feeding of sick people where we have to reduce the amount of food taken to the lowest possible amount in order to get within the limits of the weakened body for their digestion. So in rheumatism we find frequently that the underlying trouble has been that too much food-stuff has been offered to that patient, and the excess has weakened instead of strengthened the body.

Diseases of the Mouth and Teeth

Diseases of the teeth have assumed greater importance of late years since it has been discovered that the apical abscesses in devitalized teeth are the source of constitutional intoxication now referred to under the name of focal infections. Thus cases of rheumatism, of gastric ulcers, of gall-bladder disease, and of general inflammations have been traced to such hidden abscesses in the teeth. It is important, therefore, that the teeth be cared for in such a way that they cannot give rise to such abscesses. And when such abscesses are found by the use of the *x*-ray plate it is important that the teeth be removed. Of course, occasionally such an abscess may be treated and the tooth saved, but such treatment is so rarely successful and so expensive that it can hardly become the routine method of treatment.

Rigg's disease, or pyorrhea, which is a low-grade inflam-

mation of the gums about the teeth, on the other hand, rarely gives rise to systemic infections. It does give rise, however, to some malaise, and should be looked after not only for preserving the teeth as organs of mastication but also for the sake of preventing the swallowing and absorption of the toxic products of the inflammation. Preventive medicine, therefore, demands that children should be taught to brush their teeth—and that filling defects should be cared for. For this reason children as well as adults should keep in touch with a dentist and have a periodic cleaning of the teeth as well as inspection to prevent irretrievable damage.

After the taking of calomel in large doses there is sometimes an inflammation of the gums and a loosening of the teeth (mercurialism). When this occurs there should be a careful cleansing of the gums and teeth with such antiseptics as peroxid of hydrogen and potassium chlorate.

The mouth is subject to several types of inflammation (stomatitis). For example, cold sores are usually due to aphthous stomatitis and require that the ulcers be touched with some such antiseptic as full-strength grain alcohol or tincture of iodin or nitrate of silver. Even zinc sulphocarbolate would be of use.

Thrush, or ulcerative stomatitis, should be treated with carbolic acid followed by alcohol, *i. e.*, the carbolic acid on a swab should be touched to the inflamed point, and then another swab wet in alcohol should be touched to the same point to neutralize the excess of carbolic acid. Thrush is caused by a fungus called the oïdium albicans, and is found chiefly, of course, in the case of weak children. It is transmissible and, therefore, really a communicable disease. Ulcerative stomatitis is usually caused by a mixed infection of pus-forming and virulent microbes.

Vincent's angina affects the gums as well as the tonsils and pharynx. It requires the use of the tincture of iodin, or sodium biborate, or arsphenamin locally and the use of iodids internally. It is communicable and should be treated so as to prevent its spread.

Chronically inflamed tonsils should be removed. These may be either of the hypertrophic variety which stick out into the throat or of the buried type which hardly can be seen. But if the pillars of the tonsils and the mucous membrane of the palate or throat are constantly reddened and the glands underneath the angles of the jaws constantly swollen one should suspect a continued inflammation of these structures, and there should be measures taken either to remove the tonsils entirely or to treat them so as to clean up the infection.

Inflammations of the tongue (glossitis) are usually only such as result from injury and burns. These, of course, are generally so limited in extent as to be of small importance. The surface of the tongue sometimes shows changes which seem to be due to systemic troubles and which disappear when the general health is improved. Thus the coats of débris present in colonic stasis and intestinal fermentation disappear readily when the normal peristalsis is restored—and seem only slightly bettered by local treatment, such as scrubbing and gargling. The tooth marks on the edges of the tongue usually also indicate digestive disorders rather than local inflammations.

The tongue is subject to cancerous growths. These seem to be caused or at least favored by irritation from roughened teeth or from constant smoking.

The salivary glands swell up as the result of the absorption of toxic material from stomatitis, abscesses in the gums, etc. They, therefore, point to trouble above them rather than to primary inflammations. The remedy, therefore, is to seek out and treat the focus of the trouble.

Difficulty in swallowing may be due to a spasm of the esophagus, or may be due also to some disease of the esophagus. The most common disease to interfere with swallowing is cancer of the lower end of the esophagus, or of the stomach. But the common sensation in having a lump or knot just underneath the sternum is most often a nervous phenomenon, and is called globus hystericus. This is best relieved by atropin or belladonnna, and recurs

only under emotional strain. Sometimes such spasms of the lower end of the esophagus recur so frequently as to become almost a chronic condition. In such cases one finds that the entrance to the stomach, the cardia, has become smaller or spastically contracted, and in order to relieve the condition it has to be dilated by the passage of a bougie or other dilator. Sometimes such cases are treated by passing a rubber tube down into the spastically closed cardia (this is called cardiospasm) and dilating the rubber tube with either air or water and holding it dilated for a few minutes until the spasm gives way.

Of course, the injection of lye or other caustic liquids produces ulcers and scar tissue which may be sufficiently severe to close up the esophagus. In such cases it is necessary to make a new opening to the stomach through the abdomen in order to keep the patient from starvation.

Stomach Diseases

In 1923 the Census Bureau reported that death certificates showing the diseases of the stomach, except cancer, numbered 6291, a rate of 6.5 per 100,000. Ulcer of the stomach showed 3774 deaths, that is, a rate of 3.9. Of these 2526 were male and 1185 female. Cancer of the stomach and liver in 1923 caused 33,080 deaths, a rate of 34.1. In 1922 it was 31,128, a rate of 33.4. Such figures bring up the question of diagnosis, and because in America we are having all too few postmortem examinations it leaves us with a feeling that some of these statistics are inaccurate, and that if we had complete postmortem examinations the diagnosis in many cases would be changed. Nevertheless, it shows that the study of gastro-intestinal diseases deserves a prominent place in our work.

Method of Study.—The history, of course, is extremely important as to whether pain, or belching, or vomiting, or nausea, or general distress and fullness are complained of, for how long a time they have been in existence and what

time of day they are apt to come on, and whether they are relieved by eating or made worse by eating. But after the history is taken it remains for a study by *x*-ray and intubation to decide what the conditions of the stomach and bowels are. The *x*-ray examination consists in giving the patient, in buttermilk or water, barium or some other substance impermeable to the *x*-ray, and then

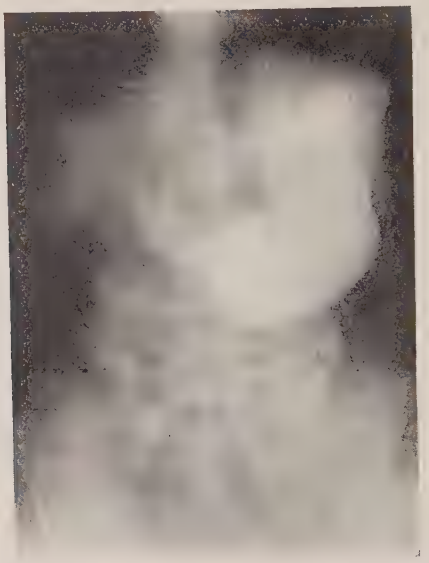

Fig. 39.—Normal stomach with deformed duodenal bulb.

viewing the patient through the fluoroscope and taking plates of the stomach and bowels. This study will show whether the outline of the stomach and duodenum is smooth and normal, or whether there are indentations or incisuræ, which would indicate ulcer or cancer. The study shows also whether the stomach empties in normal time or not, and whether the stomach is dilated or prolapsed. In the early days of the *x*-ray studies the prolapse

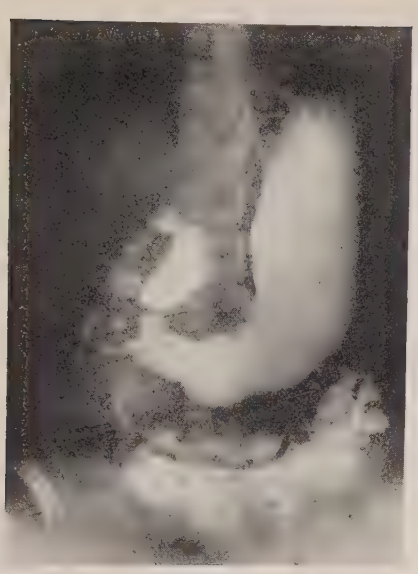

Fig. 40.—Prolapse of stomach and bowels with normal duodenal bulb

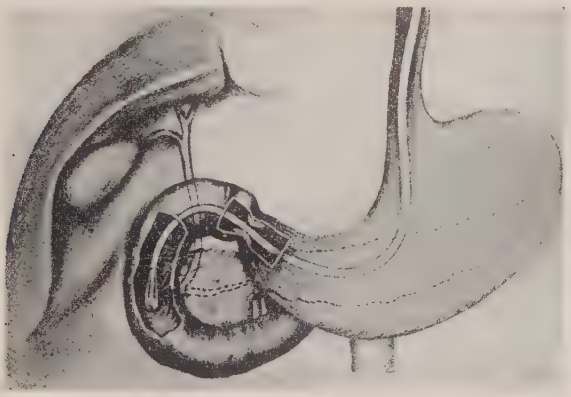

Fig. 41.—Position of duodenal tube for gall-bladder drainage (Lyons).

of the stomach was regarded as of more importance than it is now, because we are finding that nearly half of our

patients, whether suffering from stomach trouble or not, have a lowered position of the stomach, that is, the duodenum and outlet of the stomach seem to be higher than the fundus or larger part of the stomach. Consequently, only when there is difficulty in emptying the stomach do we regard the prolapse as of importance. Such a pathological delay we find when the stomach is not emptying in five or six hours. But sometimes the delay in emptying is due to nervous causes, and in such cases atropin or similar drugs must be given in order to overcome any spasm that may be present. This means, of course, repeated examinations. And it is wise to have examinations on more than one day before making a final diagnosis of gastric conditions.

The other method of study is the passage of a rubber tube to obtain the gastric contents. The best time for using the tube is early in the morning before food has been taken, because if we find then some material in the stomach we can conclude that it is a residue from the night before. That is, there is a pathological delay in emptying the stomach. Then if the contents brought up show bacteria, or blood, or other abnormal constituents we know that something is going wrong. After such a study a meal is given, and the reaction of the stomach, in the way of acidity, is then carried out. We find some patients have too much acid and others too little.

But such fluctuations in the acidity of the stomach contents may be due to mental and nervous causes. Consequently we are not able to use this reaction alone as the criterion of disease.

In other words, we must divide stomach disorders into two classes—the functional and organic. Of the functional disorders we mention here only superacidity, subacidity, and atony.

Superacidity is due to nervous excitement or overstimulation. Such excitement may be purely mental, or may be due to nerve strain elsewhere in the body. It

is characterized by pain when the stomach is empty and again when gastric digestion is at its height; that is, just before and one hour after meals. It is relieved temporarily by taking soda or some other alkali. It is also reduced by taking olive oil before meals. But the real cure is the removal of the exciting cause, whether it be nerve strain, gall-stones, appendicitis, or business worry.

Subacidity is found after surgical operations and when the patient's vitality is greatly reduced. Thus we find it in the course of exhausting labor, chronic diseases, etc., but it appears also after pyloric obstruction, constipation, and similar influences leading to a stagnation of the gastric and intestinal contents. It is, therefore, treated best by removing the underlying disease. Temporary help is given by using gastric lavage, small meals, and the bitter tonic cathartics.

Atony is usually secondary to pyloric obstruction, but may be a part of a general bodily atony. It is usually accompanied by dilation of the stomach. This, in turn, may cause the stomach to hang low in the abdomen. The result is that the food lies lower than the outlet of the stomach, thus adding gravity to the forces operating against the emptying of the stomach. The symptoms are gaseous eructations, bad taste and foul breath, headaches, a sense of fulness in the stomach, splashing (succussion), and sometimes vomiting. Its treatment depends upon the condition of the pylorus—if that be open, the dieting with frequent lavage will prove effective. If the pylorus be closed, a surgical operation is usually necessary to create a sufficient opening.

Organic Diseases of the Stomach

In contrast to the above we find the following *organic* diseases of the stomach: (1) Ulcer, (2) cancer, (3) pyloric stenosis, (4) gastroptosis, (5) cardiospasm, and (6) gastritis. Ulcer of the stomach had a death-rate in 1923 of 3.9 per 100,000. All other diseases of the stomach

except cancer showed a rate together of 6.5 (in 1910, 15.6).

Gastric ulcer or peptic ulcer is round, with smooth edges, as if bored out. It is accompanied by hyperacidity, but may have a bacterial origin. In other words, its causa-

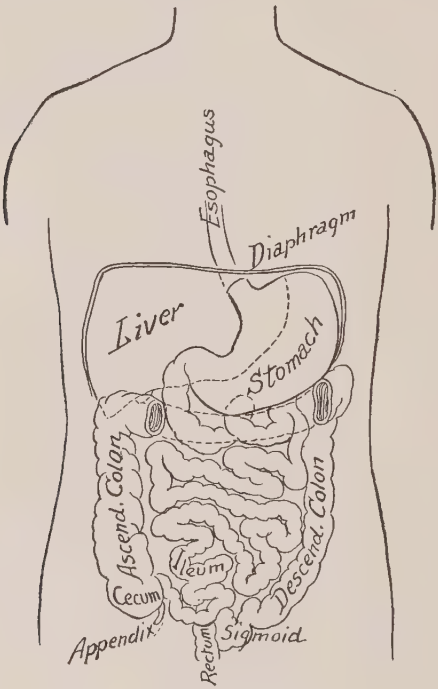

Fig. 42.—Normal arrangement of the digestive organs.

tion is disputed. But we do find that patients with ulcers frequently are afflicted with chronic tonsillitis. Again, we note that patients with ulcer are nervously exalted and sometimes even exhausted.

The ulcers heal, leaving scar-tissue contractures. If

the ulcer was in the pyloric ring this contracture makes the outlet of the stomach narrow and difficult. This causes new symptoms—those of pyloric stenosis.

Most ulcers heal easily if given rest. But there is a tendency to recurrence (especially in the spring of the year). The degeneration of the ulcer into cancer is also feared. But whether such degenerated ulcers always were cancers is still a problem of research.

The symptoms of ulcer depend on their location. The most common location is on the lesser curvature. These ulcers develop pains two to three hours after eating. Such pains are high in the epigastrium, frequently to the left of the median line, and radiate to the back. They are partially quieted by alkalies and bismuth.

Ulcers of the pylorus develop their pains three to four hours after eating. These pains are also epigastric and radiate to the back. They are quieted by food and alkalies.

Ulcers of the duodenum develop their pain four to five hours after eating. The pains are to the right of the median line. They are quieted by food, but not by alkalies.

The *treatment* of gastric ulcer (ulcus rotundum) may be either surgical or medical. If surgical, the ulcer is resected, or, if that be impracticable, a new opening from the stomach to the bowel is made (gastro-enterostomy). The medical treatment consists in absolute bed rest at least three weeks. The diet should either be that of the starvation plan or of the frequent feeding plan. In the former no food at all is given by the mouth for, say, a week. Then milk is given for several days, then eggs are added, and so on until at the end of six weeks a fairly adequate diet is given. During this time nutrient enemata may be given to assist in keeping up the patient's strength.

In the other plan of treatment a non-irritating diet is selected and frequent meals are given from the outset. Thus, milk may be given every hour, or every two hours, until the bleeding and soreness and distress pass. Then

eggs are added. Then meats or well-cooked cereals are given. The protein in these foods takes up the irritating gastric acids and thus permits the ulcer to heal. Olive oil may be given at the beginning of a meal to diminish the secretion of the hydrochloric acid.

In addition to the food, drugs are given to assist in giving rest to the ulcer walls. Thus, bismuth subnitrate may be used to coat over the raw surfaces; or this may be mixed with magnesia. Belladonna, or its active principle,

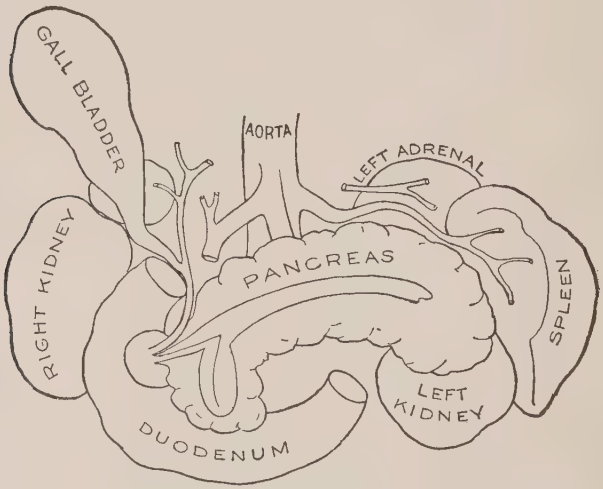

Fig. 43.—Diagram of the ducts entering the duodenum.

atropin, is also of use in decreasing the secretions and reducing the sensitiveness of the stomach membranes.

Cancer of the stomach seems increasingly frequent. It is sometimes charged to the account of chronic ulcers, but others are inclined to believe that it is due to a tissue change, or unknown cause, but starting independently of any ulcer or local irritation. Its symptoms are so in-

definite at the beginning that the condition is only infrequently diagnosed in time for an early operation. The later symptoms are pain, vomiting of dark blood (so-called "coffee-ground" vomiting), emaciation, etc. The treatment is, of course, surgical. In inoperable cases we feed eggs and milk, and similar liquid and easily digested materials that contain a high food value. We must use anodynes to relieve the pain. In general, we try to make the patient comfortable.

The *emergencies* liable to arise in both ulcer and cancer are (1) hemorrhage and (2) perforation. When the bright blood gushes from the mouth the patient should be laid on his back, an ice-pack applied to the epigastrium, and a teaspoonful of bismuth subnitrate stirred up in water given by the mouth. No food should be given for several hours. In fact, nothing more should be given by mouth until the next day, when cold water in small doses may be allowed. Rectal feeding and proctoclysis should be used to keep up the patient's strength, if such a need is evident. In perforation the symptoms are the sudden pain, the pinched face, the sweat, and the rapid pulse. The nurse should apply ice to the abdomen and summon the surgeon at once, for a laparotomy is the only chance of saving the patient's life. The result of the perforation is peritonitis, and peritonitis is usually fatal.

Pyloric stenosis is the occlusion of the outlet of the stomach. It may be due to a spasmodic contraction of the sphincter muscle at the pylorus (pylorospasm), or to the scar tissue from an old ulcer. The symptoms are pain—more or less constant—belching, bad taste in the mouth, constipation, and distention. The treatment is to relieve the stomach of its load of fermenting food by means of the stomach-tube, to use only food that will pass the narrowed pylorus, and to keep the patient quiet. In pylorospasm this line of treatment usually leads to a cure, but in a real stenosis surgical intervention is usually needed.

Gastroptosis, or prolapse of the stomach, is usually associated with dilation or enlargement of the organ. The walls are apt to be thin and the secreting glands deficient. Therefore the symptoms are those produced by the lack of gastric digestion and by the fermentation of the stagnant food. In many people the gastric condition is discovered only when they go to a doctor for nervousness or emaciation. This nervousness is probably due to the absorption of toxic products resulting from the fermentation. The constipation adds to this effect. If the condition is due to pyloric stenosis, the treatment is that mentioned above; but if the cause lie in the habits of the patient—*i. e.*, be constitutional—then the treatment demands bed rest, careful dieting, the use of the stomach-tube, and the development of the abdominal musculature. The cure is long and tedious, lasting many months. Usually better results are obtained in sanatoria than at home, because there the life of the patient can be better supervised. Because of its peculiar nature the treatment is arranged for the individual rather than for the disease. The prognosis usually runs parallel with the ability of the patient to put on fat.

Cardiospasm is a spastic closure of the upper opening of the stomach. It may be continuous (tonic) for some time, or it may be intermittent (clonic). While there may be a local exciting cause, such as in inflamed or injured mucous membrane, the condition rarely is seen except in nervous and hysteric people. The symptoms are an inability to swallow foods—in particular solids. The result is sometimes a dilatation of the esophagus from the presence of food and drink that cannot be admitted to the stomach. More usually, however, the food and drink are simply rejected, regurgitated, or practically vomited. The treatment requires the passage of graduated bougies and elastic dilators until the cardia will permit the presence of such substances without a spasm.

Gastritis is the inflammation of the stomach wall. It

is due to dietary errors, poor food, irritant food, and infection. The symptoms are pain—generally constant—and abdominal tenderness. The tongue is coated and the breath foul. Food causes pain and vomiting. Even cold water sometimes will not be tolerated. If the condition becomes chronic, as it does with drunkards, there is more or less constant distress, and the patient vomits when he awakes in the morning (matutinal vomiting), *i. e.*, retches or vomits even with an empty stomach. The tendency of such patients is to resort to alcohol and other stimulants to overcome this discomfort, but this only makes the condition worse. The treatment requires the daily use of the stomach-tube, the blandest of diet, and the use of much alkaline mineral water. Bodily rest is an important adjunct to the treatment. Usually, in order to overcome the temptation to resort to stimulants, sanatorium treatment is necessary for chronic cases.

The part that *nursing* plays in the treatment of dyspepsia is that of carrying out the dietary arrangements prescribed by the physician. That work, of course, is chiefly in the hands of the cook, and the following out of carefully made recipes is the most important part of it; nevertheless, I feel that it is important to use this opportunity to emphasize the need of careful scientific supervision of such cookery. For instance, if the physician prescribe "oven-dried" toast, or zwieback, it should be made not over the hot fire for a few moments until the sides are charred, but by securing, in the first place, a close-grained bread, then cutting it into thin slices and drying them completely through in a very slow oven (taking at least thirty minutes to do it), and, finally, by toasting the bread. This is practically the same as zwieback, which may be made, however, if so demanded by the physician, by adding eggs and sugar to the bread dough. A good substitute for this toast is the granose biscuit made by the Battle Creek Sanitarium people, or the triscuit made by the Natural Food Company of Niagara Falls.

When steak is prescribed, it should be cut thick and cooked not in grease, but upon a broiler or toaster, or, if this is not at hand, upon a very hot griddle without the addition of grease. It should not be cooked clear through. Such steak is really both appetizing and digestible.

When a milk-diet is prescribed, it may be varied and the patient relieved from its monotony by the use of various milk preparations, such as soups made with a basis of milk flavored with celery or vegetables, junket, or even bread and milk (the bread employed having been previously oven dried). Perhaps the best form of milk for patients needing stimulating food is koumiss. This is made by the fermenting of milk with yeast. Some people prefer kefir, which is milk fermented with a Caucasian fungus, and which can be procured of druggists in the larger cities. Both of these, however, contain a minute amount of alcohol and for that reason may be objectionable. Milk soured with lactic acid bacilli (*e. g.*, the Bacillus bulgaricus) is also very useful. This is sometimes known as lactone buttermilk.

When eggs are prescribed, especially soft boiled, they should not be served in a pasty condition, but simply thickened—practically raw. Most easily digested by the weak or diseased stomach is the jellied egg. A fresh egg is placed in cold water over a slow fire. The water is slowly brought to a temperature just below the boiling-point and kept there for a minute or two. The egg, which should be immediately broken and served, will have a soft yolk and a thickened (neither hard nor tough) white. Eggs may also be baked and be digestible. Again, if they be presented in the form of an egg-nog, they are still more easily taken. Egg-nogs are made in various ways. One can beat up simply the white of an egg with cream, and stir in the yolk afterward, with some sugar and slight flavor; or one may stir up the entire egg with cream and sugar. The addition of alcohol to this mixture is usually bad, and should not be done without the special advice of the physician.

The fundamental principles upon which dieting proceeds are that each person must have when moderately active—116 grams of protein and about 3000 calories of heat energy each day. It is best, unless some pecularity of the digestive apparatus demands otherwise, to distribute the food among the three classes of food-stuffs—fats, carbohydrates, and proteins—so that bulk, appetite, and digestion are conserved.

Diseases of the Liver

Since the liver has to bear the brunt of taking up and storing the greater portion of our food-stuffs, it suffers first of all in modern times from the ingestion of such poisons as are contained in the alcoholic drinks, from phosphorus, from eating too much of any type of food, such as the carbohydrates (the sugars and starches), and also from the drugs used in treatment of disease, such as the arsenic given so freely nowadays in the treatment of syphilis. Thus we have cases resembling acute yellow atrophy that are due simply to the poisoning that comes from the by-products of modern life.

The liver is necessary to life. When it is removed in experiments on animals, the animals die sooner or later. Consequently, disorders of the liver cannot be relieved by the surgical removal of the organ itself. It is necessary to treat such disorders as best we can by other means.

Jaundice or icterus is the coloring or pigmentation of the skin and mucous membrane of the body by the absorption of bile and the broken-down blood pigment, called hemoglobin. The liver ordinarily takes care of this pigment and excretes it in the bile, and it is thus carried off in the intestines. But whenever the liver fails to do its work, then the substance is resorbed by the blood and deposited throughout the body wherever the capillaries are thin enough to permit its exudation.

Catarrhal jaundice is that form in which the liver for some reason or other fails for a short time to do its work,

without there being any malignant disease or progressive disease present. This is the common form of jaundice that is found in the United States. It usually occurs in young people and lasts from four to eight weeks. The original trouble may have been a slight inflammation of the stomach or of the upper bowel which has led to an infection of the biliary ducts. When this inflammation subsides the tissues apparently return to normal and the jaundice gradually disappears.

Another form of jaundice is that already discussed in the section devoted to Communicable Diseases under the heading Hemolytic Jaundice. This is due to a systemic infection with a spirillum or spirochete.

Still another form is due to the obstruction of the passages conveying the bile to the bowel. Thus, if a stone has been formed and this stone slipped into the common duct and dammed it up, then we have the gradually increasing jaundice which disappears only when that obstruction is removed.

Again, inflammation of the liver itself—hepatitis—leads to a jaundice from the inability of the liver to take care of the broken-down hemoglobin.

The symptoms of jaundice outside of the color of the skin are the lethargy of the patient and the slowing of the pulse, the increase in the liability to hemorrhage or bleeding, indigestion, headache, etc., that is, signs of the absorption of waste products. These symptoms are similar to those which we observe in many cases of bowel obstruction. Consequently, constipation and similar colonic stases are often called liver troubles—whereas, as a matter of fact, the liver has little or nothing to do with them.

The treatment of jaundice depends, therefore, upon its cause. In all cases, however, one attempts to relieve the body of these absorbed products by increasing the action of the bowel and of the skin. The latter is done with sweat-baths and similar diaphoretics. At the same

time one diminishes the work of the body—that is, the breaking down of the tissue to form these waste products—and decreases the amount of food that the intestinal tract has to care for while the symptoms are going on.

Gall-stones

Gall-stones are formed by inflammation in the bile-ducts or in the gall-bladder itself. This inflammation may arise from the ascent of infection from the bowel due to stasis or constipation. Or it may arise from the blood-stream itself where the infection has entered the body through the tonsils or similar portals. The gall-stone seems to be similar to a pearl in an oyster—that is, an effort on the part of the body to swathe in substances of its own manufacture the irritating foreign substance. For the gall-stones are made up of the salts found in the bile. These gall-stones may be of all sizes. They may rest quietly in the gall-bladder for years without giving any symptoms; or they may be squeezed down into the duct, some to pass through with little or no pain into the bowel, and thus be excreted; and in other cases to obstruct the bowel, cause a distention of the duct and of the gall-bladder behind it, and thus cause intense pain—the familiar colic, known as "gall-stone colic." Herein the pain is in the right upper quadrant of the abdomen and is hard to distinguish from indigestion due to gastric disturbance, or to even duodenal ulcer. When, in addition to the gall-stones themselves, there is an added active infection present, we have an inflammation of the gall-bladder called cholecystitis, with fever, intense pain, and usually jaundice. There may or may not be vomiting, but there is a general distaste for food and indigestion; usually there is a great deal of constipation, that is, difficulty in getting the bowels to act.

The treatment is usually rest, the application of heat, the use of packs and other means of producing sweats, and as soon as it is safe, the operative removal of the

gall-stones or of the gall-bladder itself. The pain is relieved, of course, by the hypodermic use of atropin and morphin.

Gall-stones are made up of such different substances, as cholesterin, lime, and mucus, that rarely can they be seen by use of the *x*-ray.

The presence of gall-stones does not always indicate disease or the necessity for surgical operation, but they do cause a slowing of the bile flow and chronic thickening of the walls of the gall-bladder. Then when they are crowded out of the gall-bladder into the duct, they cause considerable pain in the so-called cystic duct until they get down into the larger common duct, which gives them freer passage. This obstruction of the ducts is manifested then by gall-stone colic, which is a sudden sharp excruciating pain running from the right side under the ribs to the right shoulder-blade. However, sometimes the pain is complained of under the left shoulder-blade and sometimes even they speak of it as being near the heart. The obstruction of the common duct leads, of course, to the prevention of the entrance of the bile into the bowel, and we have then a change in the color of the stool, the feces. We have then the clay-colored stools, spoken of as a symptom in jaundice and similar liver troubles.

Abscesses of the Liver

Abscesses of the liver are more common in tropical countries than in our latitude. However, they are present more often than diagnosed. In the tropics they may be caused by amebæ, and in those cases the abscesses are usually single. Again, we have abscesses due to echinococcus. The natural outlet for these abscesses is on the upper side of the liver toward the diaphragm. If they do nothing worse, they cause an adhesion of the diaphragm to the liver. This, in turn, carries the abscess up to the pleural surface, and if the process continues the

abscess may rupture through into the lungs and thence into a bronchus and be coughed out. If the abscess works in the other direction, that is, into the abdominal cavity, it might cause peritonitis and death.

The symptoms are usually: septic type of fever, chills and sweats, pale and jaundiced skin, with swelling and pain in the region of the liver.

The treatment is, of course, operative as soon as the diagnosis can be made.

Cirrhosis of the Liver

Cirrhosis of the liver caused 18 deaths per 100,000 of males and 8.9 deaths per 100,000 of females in the years 1911 to 1916. From age thirty-five and upward, the rates rapidly increased. Thus from thirty-five to forty-four, it was 19.2 for males; from forty-five to fifty-four, it was 44.1; from fifty-five to sixty-four, 74.9; from sixty-five to seventy-four, 104.7; from seventy-five and over, 108.7. The death-rate in the cities is 50 per cent. greater than in the country districts. In 1923 the deaths numbered 7027 (males 4546, females, 2370), a rate of 7.2 per 100,000. The greatest number of deaths occurred between the ages of sixty and sixty-four. It is evident that the seriousness of cirrhosis of the liver has generally been underestimated in the discussion of public health problems.

This disease and chronic hepatitis are diseases of the liver itself wherein the tissues of the liver are gradually changed and replaced by scar tissue which contracts down and thus interferes further with the passage of even the blood through the veins of the liver. Inasmuch as the portal vein takes all the blood from the bowel and carries it through the liver, such an obstruction to the circulation causes serious effects in the way of distention of the veins below the liver and of indigestion, and, finally, of exudation of fluid into the peritoneal cavity producing what we know as ascites. There is frequently hemorrhage from the stomach or from the esophagus in this disease. And finally the heart is affected, so that it is difficult

sometimes to know whether we are dealing with a primary heart disease or a primary liver disease. The cirrhosis has usually been attributed to the steady drinking of alcohol through a long period of time. It may also be due to the taking in of other poisons through a long period of time. Of course, in cirrhosis of the liver or hepatitis there is the failure of the liver to do its work as a storage-house for sugars and similar food products, and we have a gradual emaciation of the patient with this distention of the abdomen just mentioned producing a peculiar but characteristic picture.

The hemorrhages from the stomach occur in the lower esophagus and in the cardiac end of the stomach, but also there is present almost always piles and hemorrhages from the lower bowel, because in the lower rectum is a point where portal and general circulations meet. And in cirrhosis of the liver venous varicosities are found here, and these may rupture and cause severe hemorrhages. A third region where varicosities may result is about the navel, and we have then the enlargement of the veins of the skin about the navel in the form of what is known as the "head of Medusa."

Cancer of the Liver

While cancer of the liver is usually secondary to that of some other organ, yet it is relatively frequent. If the primary seat of the cancer be in some tissue that is not very vital, then one is able to make a diagnosis of the cancer of the liver by the change in the size and shape of the liver or by the feeling of the rough surface where the liver extends below the ribs.

Pancreatic Diseases

Inasmuch as the bile-duct empties by a common tube with that of the pancreas into the bowel frequently inflammations of the bile-duct extend into the pancreatic substance, and then produce a more complicated picture

due to the interference with the action of the pancreas. The result is, of course, the lack of digestion of food insofar as it is dependent on the pancreatic secretions. And inasmuch as most of the digestion in the intestines is due to the pancreatic ferments, the interference with the pancreatic ducts leads to almost complete indigestion. One notices it, however, by the large bulky bowel movement containing great quantities of fats because it is the lipase or fat ferments of the pancreas that is most characteristic of its action. The obstruction of the pancreatic glands cause changes in the pancreas itself and may cause the gland to atrophy and its secretion almost disappear. Or the obstruction may cause the formation of pancreatic stones which tend to increase further the obstruction to the duct and give rise to a great deal of pain in the upper abdomen. This confuses the picture so that one does not know whether the pain is due to gall-stones or to pancreatic stones, or to gastric ulcer.

The injury to the pancreas produces another effect, that is, on the internal secretion of the pancreas. We have then the symptoms of diabetes.

Diseases of the Small Intestine

It is difficult to obtain a very accurate statement of the number of deaths due to diseases of the small intestine because they are so linked up with the diseases of other organs. Thus cancer may occur in the small intestine, but the origin is usually elsewhere. So also the digestive disturbances in cases of heart and kidney diseases are very real affairs, but the intestine is hardly at fault. In children enteritis is usually due to improper eating. And in adults liver disease is an accompaniment of many cases of enteritis.

But the statistics as found in the census returns show death-rates of 28 for males and 28.9 for females per 100,000.

The following table of rates at the different ages is worth some thought:

REGISTRATION AREA IN THE UNITED STATES BETWEEN 1910 AND 1915

Years.	Rate.
1– 4	232.3
5– 9	8
10–14	2.2
15–19	1.5
20–24	1.9
25–34	3.2
35–44	5.4
45–54	9.1
55–64	19.2
65–74	48.8
75 and over	173.6

The figures are for males only. Those for females are slightly less. Colored persons, especially when considered for specific age periods, show higher rates than do white persons. The rates in the city exceed those in the country.

The small intestine has remarkably few disorders when we consider its length and the offices which it performs. It is subject to obstruction, inflammation, and, of course, neoplastic growth. Obstruction is usually due to a twisting of the small bowel on its mesentery. The condition is called ileus. Obstruction, of course, may also be due to the slipping of the bowel into one of the openings where hernia occurs, for instance, in the inguinal canal. Obstruction, again, may be caused also by the pressure of a tumor or some other body from the outside of the bowel against it. And, again, an obstruction may be caused by impaction of the contents of the bowel.

ACUTE ENTEROCOLITIS OR ILEOCOLITIS

Acute enterocolitis or ileocolitis may be classified into three groups: catarrhal, ulcerative, and membranous.

Acute catarrhal enterocolitis has a sudden onset. The temperature runs at about 102° to 103° F. The abdomen is distended, the colon is sensitive to pressure, and there is some vomiting. Such a diarrhea may continue for one or two weeks.

The *ulcerative* form exhibits the same general symptoms, but the stools contain mucus and blood, and the course is longer.

The peculiarity of the *membranous* form is the appearance in the stools of sloughs of membrane. While apparently it is the mucous membrane of the bowel that is sloughing, yet investigation shows that these sloughs are merely pieces of a false membrane made up largely of mucus.

Inflammation of the bowel is most often due to the fermentation of the foods. This is brought about sometimes by improper food, spoiled food, sometimes by a slowing up of the peristalsis so that the food has time to decay, putrefy, or ferment inside the walls of the vessel; and again, the inflammation may be due to the presence in the bowel of some bacteria or other living agents. Thus the intestinal parasites really cause an inflammation, although this is of a very low grade.

Fermentation of the food is probably caused often by the failure of the digestive glands to perform their duty correctly. This, in turn, may be due to exhaustion or nervousness or some upset of the body itself. Hence, it is that in such condition one first of all puts the patient to bed to rest to regain his strength in order that his digestive juices may become normal again. Of course, pain is the chief symptom of this enteritis, and this is due to the distention of the bowel through the evolution of the gas from the fermenting or putrefying foods.

Food is resorbed from the whole length of the small intestine. In the duodenum, however, we have chiefly the mixing of the food with the pancreatic and bile juices. But even here there is considerable resorption. The wave-like contractions of the bowel, called peristalsis, carry the food through this part of the bowel very rapidly. The peristalsis slows up to some extent farther down and gives greater time for absorption.

The first step in the treatment of this fermentation,

or flatulence, is the cleansing of the bowel. And for this purpose the best cleanser is castor oil, for castor oil acts only in the small intestine and does not irritate the bowel. Following the use of the castor oil one either starves the patient or feeds only milk, or some such substance that has practically no liability to ferment. And with it all one keeps the patient quiet and in bed. The use of hot-water packs or stupes, electric light, or electric pads, or hot-water bottles are all useful in allaying the pain due to the distention of the bowel. If the castor oil fails to act promptly, then enemas of soapsuds or oxgall should be used.

Diarrhea is usually nature's effort to get rid of an irritant substance in the bowel, but it may be due to the necessity of the bowel acting more freely, as in the case of uremic poisoning or wherever the other emunctories are not doing their duty. The primary need, therefore, in diarrhea is to assist in cleansing the bowel by the use of castor oil, or calomel, or some other quickly acting purge.

When the diarrhea becomes bloody, we call it dysentery. But most dysenteries are caused by infectious agents, and these we have discussed elsewhere, where also we discussed the treatment of the more serious cases of diarrhea.

Constipation

Constipation is usually due nowadays to the habits of life of modern civilized man. For example, the rush of life today is so strenuous that the nervous energy of the patient is either exhausted or the patient is so wrought up that the normal rhythmic action of the vegetative nervous system is interfered with and the bowel does not act normally, but is held more or less spastic by these nerves. Again, the food that is used today is of such a nature as to cause very little peristaltic movement. It would be better were we to eat more of the coarser, rougher foods of our ancestors. Then, again, the hours that we spend in activity are so long and the hours that

we spend in sleep are so short that there is a good deal of exhaustion. And this exhaustion helps with the nervous tension to keep the bowel from being as active and as rhythmic in its action as it should be.

Temporary constipation, that is, obstipation, is usually due to some spasm of the bowel or to some obstruction of the bowel or to some constriction of the bowel. This, of course, should be treated in a direct and radical way to bring about quick results. But chronic constipation requires usually changes in the life and method of living before it can be successfully treated.

In the first place, children should be taught good habits. These include the thorough mastication of food (the habit of eating slowly and chewing well, if you please), a healthy development of the abdominal muscles, and the going to stool at a regular time each day. To assist in teaching the careful mastication of food children should not be allowed to drink at meals, and should become accustomed to eat dry breads and similar foods. To illustrate, the writer has seen boys and girls cram their mouths with food and then wash it all into their stomachs with huge gulps of water, without any mastication at all. This habit cannot help producing digestive troubles later on. Again, free exercise in the outdoor air will help both boys and girls to obtain a better development of the muscles of the trunk than any amount of proper sitting about indoors could give. The prudery that keeps a girl of eight to twelve years of age perched in a chair learning to sew or knit or play with dolls or practising on the piano while her brother is enjoying a romp out of doors is to be condemned. And, finally, both children and adults should make it a habit to look for an evacuation of the bowels before leaving home in the morning.

Constipation is really the cause of very many diseases not associated with it in the popular mind. Thus gallstones, jaundice, appendicitis, enteritis, hemorrhoids, typhoid fever, etc., are assisted into being by habitual

constipation. Even old age and its feebleness are in part at least due to the absorption of poisons generated by the fermentation of food in the large bowel.

Treatment.—Any method of combating constipation must take cognizance of three elements of cure: (1) A development of the muscular action of the abdomen and bowel, (2) an increase in the supply of fluid within the bowel, and (3) a regulation of the habits and diet so that sleep and rest shall regularly alternate with waking and work.

Drugs, then, are merely temporary expedients used to overcome the results of bad habits and to get the bowels into a proper condition for this regulation of the habits, and the development of the body to take its effect. However, most patients wish for some drug or charm which will overcome constipation, but permit them to go on in their same old lazy, torpid, and unnatural mode of life. Neither drugs nor mineral waters nor massage nor even electricity will quite take the place of active and energetic living in accord with the laws of health.

For active catharsis castor oil in tablespoonful doses is probably safest. Epsom salts, in similar dosage, ranks next. Either of these may be repeated until the bowel movement occurs. For overnight laxatives cascara sagrada is best. Of this, 15 to 25 drops of the fluidextract should be taken at bedtime.

Should one be directed by the physician to take mineral waters, he will find it usually best to take the prescribed quantity the first thing on rising in the morning, at least one-half hour before breakfast. After swallowing the water the patient should, unless he be quite weak, walk about until breakfast. Epsom salts taken in this way are quite as satisfactory as most of the mineral waters—especially if charged with carbonic gas sufficient to form a briskly effervescing drink.

The cathartic salts are magnesium sulphate (Epsom salts), sodium sulphate (Glauber's salts), potassium and

sodium tartrate (Rochelle salts.) Aside from these in varying quantities in the mineral waters we find sodium chlorid, or common table salt, traces of iron, and the other metals, etc. For instance, the celebrated Carlsbad Sprudel salt contains:

	Per cent.
Carbonate of lithia	0.20
Bicarbonate of soda	36.11
Sulphate of potash	3.31
Sulphate of soda	41.62
Chlorid of sodium	18.19
Fluorid of sodium	Traces
Borate of soda	0.03
Anhydrid of silicic acid and oxid of iron, lime, magnesia	Traces

Therefore, in this water one obtains chiefly Glauber's salts, and, except for the mental effect, one can obtain practically as good results by using combinations of the various cathartic salts.

But, in general, the cathartics soon become ineffective, in that the bowel becomes so used to them that no increase in the peristalsis results from their presence. Hence it is better from the beginning to put the emphasis upon the development of good abdominal muscles and the correct habits in eating and resting, and not depend upon drugs.

In cases where there is obstruction or a narrowing of the lumen of the gut, white vaselin or liquid petrolatum, taken in tablespoonful doses at night, will be safest and most effective. It acts as a simple lubricant and, in contrast to olive oil, which is often used for the same purpose, is not absorbed by the bowel. Its action is not evident for three or four days from the beginning of the treatment. Therefore, at first, we must supplement it with active cathartics.

The increased amount of fluid can be largely cared for by drinking more water. Thus, to drink half a glass of water every hour will prove very effective (in combination with muscular development and good habits) in setting up free evacuation of the bowels.

Of late years there has been preached the doctrine that

daily enemata constitute a panacea for constipation. As we have tried to state above, we believe that patients should not put their reliance entirely on rectal irrigation. Its danger is that it tends to weaken the natural efforts at peristalsis, and therefore renders the patient more and more dependent upon it for freedom from colonic stagnation. On the other hand, we believe that rectal flushing is one of the best methods of clearing out the colon when nature has proved herself unable to accomplish the task. Therefore, between the evils of strong cathartics and those of the daily enema, we would choose for our patients the enema. Simple sterile water—that is, water from the boiler that has been cooled without the addition of tap-water—is the best solution. When more active results are desired, an enema of strong soapsuds may be used. The treatment of chronic colitis requires irrigation with solutions of ichthyol and similar tonic drugs.

In babies the use of glycerin suppositories assists in establishing the habit of regular bowel action; and in adults, where the act of defecation is painful, the use of laxative suppositories will ease defecation. In the case of adults the suppositories are made of mixtures of various drugs, according to the temporary need of the patient.

Of the measures which the nurse can execute, abdominal massage is perhaps the most effective. The nurse places her flat hand over the right iliac fossa and begins a circular motion in the direction of the hands of the clock, with a radius of 2 inches. Continuing this motion, she moves her hands gradually up toward the liver, then across the epigastrium, and down the left side. She should keep this up for about fifteen minutes.

The patient herself can strengthen her abdominal muscles greatly by carrying out a few exercises. The first is to lie flat on her back, preferably on a hard surface, like the floor, and raise each leg in alternation to the vertical without taking hold of any support with her hands.

This should be kept up for at least five minutes. The second exercise is to press in with both hands over the abdomen round about the navel, then force out the indentation by taking a deep breath and contracting the abdominal muscles. This exercise should be worked over at least twice a day for about five minutes each time. The rolling of a 6-pound cannon-ball over the abdomen is another device for exciting peristalsis and strengthening the muscles. The ball should be rolled in the direction of the colon, *i. e.*, from the right iliac fossa up close to the ribs, across the abdomen, and down the left side.

Appendicitis

In 1925 there were reported in the United States 15,618 deaths as due to appendicitis and typhlitis, a rate of 15.1 per 100,000. The highest rate occurred in patients between fifteen and nineteen years of age. Among the colored the rate was greater than for whites, and for males greater than for females.

The appendix is located on the lower right quadrant of the abdomen between the hip and the navel. This location is such that it is difficult to distinguish whether pains in that region are in the appendix or due to a stone passing through the right ureter, or in the female due to inflammation of the ovary and tube. Consequently, unless the attack be a classical one, giving all the symptoms described under the term "appendicitis," one needs to be careful before making that diagnosis.

The appendix vermiformis is a blind tube from $1\frac{1}{2}$ to 5 inches long with a lumen varying from $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter, attached to the cecum about $\frac{3}{4}$ inch from the ileocecal valve. The appendix has the general structure of the ileum and contains some lymphoid follicles and intestinal glands. The inflammation may be due to the participation of the appendix in a general enteritis or colitis or to some special irritation or infection of the appendix itself. In any case symptoms begin to show when the mouth of the appendix becomes swollen shut,

preventing the escape of the products of the inflammation from within the appendix. This causes a swelling of the appendix with the consequent pain and fever. If, now, the appendix is not opened by nature into the cecum, the side wall will probably be perforated and permit the escape of the purulent contents of the appendix into the peritoneal cavity. If the omentum and mesentery are not lying closely enough to the perforation to dam up the pus, a diffuse general peritonitis results. In this there is an exudation of serum into the peritoneal cavity from the membranes of the peritoneum, the germs from the appendix multiply rapidly, the bowels become matted together, and covered with this purulent serum and fibrin. Death results from the absorption of the toxins generated in the pus.

If the omentum does wall off the pus escaping from the appendix, an abscess develops, or a circumscribed peritonitis.

The symptoms of appendicitis begin suddenly and consist of pain in the abdomen, particularly in the upper part (epigastrium), fever varying from 101° to 104° F., and vomiting. In a few hours there develops exquisite tenderness over the point one-third the way from the anterior iliac spine to the navel. Rarely can any swelling be noted there unless the appendix be already perforated and an abscess formed. If possible, the abdomen should be opened and the appendix removed within forty-eight hours from the beginning of the attack, otherwise perforation and peritonitis may occur. The symptoms of the peritonitis, besides the general abdominal pain and fever, are chiefly the distention of the abdomen and the general tenderness.

If the peritonitis has become general, very little hope can be entertained of saving the patient's life, even by an operation. The pus may be drained off somewhat, but the chief dependence must be placed on supporting the patient's strength, keeping him quiet, and giving him

nothing but water by the mouth, applying ice-bags to the abdomen, and using hypodermics of strychnin and other stimulants.

Colitis

Colitis is a much more common disease than the literature would indicate. The fact is that attention has not been directed enough to the inflammation of the lower bowel. We used to think that all inflammations of the colon caused diarrhea, but we now know that many cases of constipation are due to this same inflammation of portions of the colon. It is not essential that all portions of the colon be inflamed at the same time. On the other hand, chronic inflammation of the colon may exist in different segments. Thus the cecum is a pouch at the beginning of the colon and may be inflamed on account of stasis, or inability of the colon to push its contents forward. Distention of the cecum would give rise to pain in the lower right side of the abdomen and to general indigestion and constipation. Again, the portion of the colon under the liver called the hepatic flexure may be the chief site of inflammation, and in that case it would be hard to distinguish it from affections of the liver or from ulcers of the duodenum or stomach. And still further, the inflammation of that portion of the colon under the spleen in the upper left portion of the abdomen is hard to distinguish from inflammations of the kidneys, spleen, or even of the stomach. Inflammation of the sigmoid or of the lower end of the colon in the lower left quadrant of the abdomen give rise to diarrhea more frequently than do inflammations in the other parts. Pain in this quadrant of the abdomen might also be produced by trouble in the left ureter or in the case of the female in the left tube or ovary.

Colitis is more frequently charged to irregularity in the habits of eating and of evacuating the bowel. These bad habits are usually started in childhood. Sometimes, however, the inflammation of the colon is due to outside

infection, as has been discussed elsewhere under the head of Infectious Diarrheas.

The **treatment** of colitis calls for a regulation of the habits of eating, of taking care of the body, and of emptying the colon. Probably the acute inflammation requires, first of all, the washing out, or irrigation of the bowel with suitable substances, such as ichthyol, to heal the mucous membranes. In addition to that, the food must be so bland, that is, so easily digested, that there is no irritation of the colon set up by it. Then, too, the patients must be taught to lie down and rest after meals.

Because of frequency of colonic stasis, and the absorption of poisons from the bowel, some surgeons have tried to get rid of the difficulty by cutting out some or all of the colon itself. This would be an ideal arrangement if it were safe. But the mortality from the operation is very great and the success of the operation depends upon so many factors as to make this a method of procedure to be accepted only in very distressing and bad cases.

The best treatment today is a combination of adequate rest periods, a diet suited to the patient's life and work, and the use of irrigations whenever the condition becomes acute.

CHAPTER XXV

DISEASES OF THE CIRCULATORY SYSTEM

Heart Disease

The death-rates from heart disease are, to say the least, impressive. Thus we find the following analysis of the death-rates in the United States Government reports for 1911 to 1916:

Age.	Per 100,000: Males.	Females.
1– 4	7.6	7.6
5– 9	12.6	15.3
10–14	16.6	21.2
15–19	19.7	20.4
20–24	20	23
25–34	33.4	36.9
35–44	76	76.8
45–54	175.5	160
55–64	474.4	409.3
65–74	1213.8	1044.1
75 and over	2665.6	2438.6

The general rate was 147 for males and 140.7 for females.

The death rate in 1924 was 178.1, that is, a total of 176,671 deaths. In 1925 the rate was 185.5, a total of 191,226 deaths. This increasing death-rate has caused considerable alarm, and there has been formed an association for the study and prevention of heart disease, especially among children.

In commenting on this the statisticians of the Metropolitan Life Insurance Company speak somewhat as follows:

"The rates for females are higher than for males up to and including the age period of twenty to twenty-four years. After this age period, however, the situation is reversed, the death-rate for males being very much higher than for females. This is uniformly true for white lives,

but there are a few exceptions among the colored. It would appear, therefore, that these organic heart diseases in their higher incidence among adult males strike heavily at the chief or only income-producers of families, often after long periods of sickness in which the wage earner has been unable to work actively or only part of the time. These diseases thus bring about hardship and distress which cannot be shown in figures. In fact, if it were possible to calculate the money lost to the country through death from the heart affections and the long periods of sickness which precede them, the importance of cardiac disease economically would be much more impressively demonstrated than is possible by the publication by mere numbers of deaths and its corresponding death-rate. Probably the reported increase in the number of deaths from heart diseases in the last few years does not indicate that the real number of heart diseases is increasing. Rather, it indicates more accurate observations. We have also to consider the fact that many cases of kidney disease die as heart disease."

The symptoms of heart disease are weakness, shortness of breath on exertion, swelling of the ankles toward night, and indigestion.

The principal causes of heart disease are: (1) rheumatism (*i. e.*, infection of the blood-stream with a streptococcus), (2) syphilis, (3) arteriosclerosis, and (4) kidney disease (nephritis).

Methods of Study.—The physician examines the patient suspected of heart disease with a stethoscope to detect whether or not there are abnormal murmurs over the heart region, and whether the accent of the heart is right, and if the rate is perfectly regular. In other words, he examines for murmurs and arrhythmia.

The blood-pressure is taken in different positions to show whether the heart is able to overcome the different amounts of pressure due to posture. In fact, listening to the blood as it flows under the band of the blood-pressure

instrument gives a fairly good index of the tone of the circulatory apparatus.

Tracings are made on the polygraph of the action of the heart. These instruments give a simultaneous tracing of the action or pulsation at the wrist, at the neck, and

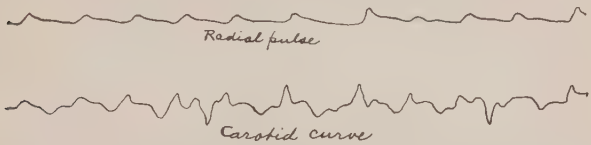

Fig. 44.—Polygraph tracing in a patient suffering from myocardial changes.

over the apex of the heart. This, of course, is of value chiefly as to the matter of regularity and rhythm.

The newly popularized instrument, called the electrocardiograph, traces the action of the heart in still more

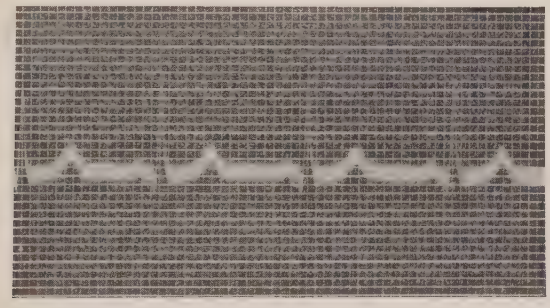

Fig. 45.—Normal electrocardiogram. The sharpest peaks are made at the closing of the valves. The ones preceding these are due to the action of the atria, and the ones following the sharp peaks to the ventricular muscles.

minute details. For every action of the heart causes a minute electric current to flow from one side of the body to the other. Therefore, by attaching electrodes to the two arms and one leg one is able to detect these currents

whether they are abnormal or normal. Such records are especially valuable in disorders due to the nervous control of the heart muscle as well as in some kinds of weakness of the heart muscle.

Finally the *x*-ray is called upon to show the size of the heart, whether there are aneurysms about the large arteries, at the base of the heart, or whether these arteries themselves are dilated. Such *x*-ray plates are made at the distance of 2 meters in order that the rays of light coming from the *x*-ray tube may be parallel and give a correct estimate of the size of the various organs.

Such studies enable the physician to determine whether the disorders complained of by the patient are due to organic disease of the heart and arteries, or whether they are simply due to disturbed functions, such as nervousness or reflex influences.

The **rheumatic heart** is usually one with leaking valves. This limits the patient's strength, but does not ordinarily lead to immediate death. On the contrary, if a child who acquires a rheumatic heart will limit his activities to his real strength he has a chance of living a life of average length. In this disease the valves become thickened and stiffened, so that they do not prevent the return flow ("regurgitation") of the blood into the chamber that they guard. Naturally, this leads to a stasis of the circulation, and the consequent swelling of feet and ankles and the bloating of the abdomen (*i. e.*, filling of the peritoneal cavity with ascites).

The **syphilitic heart** exhibits usually a roughened and dilated aorta, with weakened musculature. The evidence is usually a murmur over the aortic valve and an increase in the size of the organ. The patient suffers from heart pains and shortness of breath. This disease usually appears in the twenties or thirties and leads to death within a few years. The favorite location of the spirochetes seems to be in the arch of the aorta, and the inflammation they set up leaves stellate scars showing on the

inside of the vessel. The disease may appear in a year or two after the receipt of the infection ("chancre" or "primary sore"), but usually is not discovered until five or ten years later.

Arteriosclerosis is a disease of old age, but the vessels in and about the heart, and the myocardium itself, may be affected early in middle life. For "we live in deeds, not in years"; and our arteries register our real age. The man who leads a monotonous life is liable to a rude awakening early in his fifties to find his heart and arteries rigid and inelastic. The first symptoms usually are severe pain (angina pectoris) and shortness of breath on exertion. The outcome depends on the patient—if he can change his whole mode of life as soon as the first symptom appears, he stands a good chance of living several years. If he persists in his old style of life he will last only four or five years.

Chronic kidney disease throws an added burden on the heart and sooner or later the heart breaks down under it. Usually it affects the musculature and produces irregular heart action as well as weakness. The heart dilates or becomes hypertrophied, or both. Generally it is the kidney disease that finally leads to the patient's death, but his heart weakness adds greatly to his discomfort.

Now considering the various types of heart disease from their anatomic standpoint we find (1) valvular disease or endocarditis, (2) inflammation of the sac surrounding the heart, or pericarditis, (3) aneurysm or dilatation of the vessels at the base of the heart, and (4) heart-block or interference with the nerve conduction paths about the base of the heart.

Endocarditis is an inflammation of the membrane lining the chambers of the heart. This inflammation is due to the settling of microbes from the blood-stream in the depressions and exposed points of the walls. At the point of settlement there are found little nodules which are called vegetations. The favorite place for such growths

is on the edges of the valves of the heart, but in severe infections one finds them also on the walls of the heart chambers. The effect of such excrescences on the heart valves is, of course, to make the edges of the valves irregular and ill-fitting and thus cause a leakage of the valves when they close. Fortunately, many of the vegetations disappear when the acute condition is passed, but, for the most part, they remain and form scar tissue, thus presenting permanent injury to the efficiency of the valves.

For our purposes we may consider endocarditis as of two types: the simple endocarditis, such as comes in the ordinary course of rheumatism; and the malignant or the ulcerative endocarditis that comes when the infection is due to a particular virulent organism, such as the green-forming streptococcus (Streptococcus viridans) or the Streptococcus hemolyticus. In the case of simple endocarditis the result is damage simply to one valve or, at most, two valves, and a thickening and stiffening of the edges of the openings so that there is more or less of a leakage. In the malignant type (endocarditis lenta) one finds vegetations not only on the valves but also on the walls of the heart chambers and elsewhere in the arteries and veins. With it we have an irregular fever coming on and disappearing in a most erratic way. We find also the frequent formation of clots or thrombi or emboli in the various capillaries, so that the patients exhibit black and blue spots on the skin in various parts of the body called petechiæ.

When the leakage of the valves is so great as to wear out or exhaust the heart muscles because of the extra exertion needed, then we have an irregular action of the heart, irregular both in time and force and increasingly inefficient. We call this decompensation. With it there is swelling of the feet and ankles, sometimes even of the hands. The abdomen is distended with fluid (ascites). There is also shortness of breath, blueness of the face,

and other signs of insufficient oxygenization of the tissues of the body.

The *treatment* for valvular disease demands, first of all, rest. The patient must lie as nearly flat as possible. An ice-bag over the chest helps quiet the excited heart. Simple and limited foods also help. For example, an exclusive milk diet is so often prescribed that it has received a definite name, the "Karrel treatment." As soon as the heart becomes regular and quiet in its action again (*i. e.*, becomes "compensated"), the patient is started on graduated exercises. Beginning with very light work, such as raising the legs and arms, one gradually proceeds to walks of measured distances. Sudden exertion, shocks, and chills are, of course, to be avoided, On such a restricted life cardiopaths may live for years.

When the sac in which the heart is placed becomes infected we have **pericarditis.** Usually this means that the amount of fluid inside the sac is increased. Sometimes the infection is so virulent that this fluid becomes real pus. This increase in the amount of fluid causes the apparent size of the heart as outlined by percussion to increase, so that the outline is roughly that of a helmet in the middle of the chest. It causes a sense of oppression and weakness and shortness of breath.

Pericarditis is usually a complication of a neighboring inflammation, such as a left-sided pleurisy, or even an endocarditis. It is difficult to diagnose. Fortunately, it is seldom in itself fatal, except when the fluid is purulent. The outcome of the disease therefore usually depends on the primary inflammation.

The *treatment* requires bed rest, the application of cold, and, if the amount of the fluid be so great as to interfere with the heart's action, incision and drainage.

Heart-block.—Nerve impulses are transmitted from the nerve-centers or ganglia at the base of the heart down to the ventricles by a neuromuscular bundle called the bundle

of His. In cases of arteriosclerosis this bundle becomes hardened and fails to transmit the messages regularly and evenly and sometimes entirely. Consequently, the atria or auricles may be beating at the rate of 72 a minute and the ventricles at 28. That is, the pulse at the wrist might register 28 or 56, and yet the ear when placed over the heart might hear twice as many beats per minute. This condition is called *heart-block*.

Similarly, the conduction paths may be so upset that the impulses go out at all sorts of irregular intervals—so much so that few regular beats reach the wrist. This is called auricular fibrillation or the pulsus irregularis perpetuus of the older writers. If the condition is caused by arteriosclerosis, it is bound to recur. If it is due to a nervous disease or reflexes from the abdominal tract, its prognosis depends on the patient's willingness to correct the underlying troubles.

Angina pectoris is a sharp pain felt under the left breast and running down the left arm. It is so severe as to paralyze the patient for the moment. It ceases as suddenly as it comes. It is due to the thickening and hardening of the coronary arteries which supply the heart muscle with blood. It is relieved by vasodilators (*i. e.*, drugs that expand the arteries, such as nitroglycerin or amyl-nitrite).

Acute dilatation of the heart is the response to some shock that exhausts the power of the heart to contract. Sometimes such shocks are nervous; sometimes they are reflex, as from the intestinal tract (*e. g.*, the reported cases of death from acute indigestion); sometimes it is strictly physical overstrain. When one listens to such hearts one hears over all the orifices a loud murmur usually systolic in time. Such acute dilatation may be fatal, and that within a few minutes. But if the heart were fairly sound to begin with, then by keeping the patient absolutely at rest there is a chance of recovery.

That means then that the treatment consists in getting

the patient flat on a couch or bed or even the floor, taking off all constricting clothing, and the use of quick stimulants, such as strychnin. The stomach should be emptied if possible. At any rate, no food should be given until the heart recovers its tone. In default of a doctor, one might, however, use strong black coffee as a stimulant, but not in large quantity.

In view of the foregoing the increasing number of deaths attributed to heart disease should lead to prophylactic measures tending to protect the heart in case of rheumatism, to secure better treatment for syphilis, and to ward off arteriosclerosis. In case of rheumatism bed rest should be insisted upon until all danger to the heart is past. This usually means from three to six weeks. In case of syphilis early and adequate treatment with mercury and arsenic should be instituted. This means treatment for several months. These two things will probably be granted, but really the need today is to protect our men and women from the constant and one-sided strains that lead to arteriosclerosis. Living at too high pressure and without an adequate use of the muscles in the open air is responsible for many cases. The diet should be adapted to the kind of life led and should be varied. I do not think that vegetarianism will protect us from arteriosclerosis. On the other hand, a sedentary individual should not eat a preponderance of meats. In other words, a hygienic life must be held up to our young men and women as the only one likely to keep them from premature old age.

Diseases of the Arteries

These improved methods of study have enabled us to separate out from the general group of heart diseases many diseases which are really due to diseases of the arteries rather than the heart. Thus under the head of diseases of the arteries, veins, and aneurysm, etc., we find in 1924, 23,278 deaths, that is, a rate of 23.5 per 100,000. In 1925 the number was 23,090, a rate of 22.4.

Of the arteries the one most usually affected is the aorta. This becomes inflamed, enlarged, thickened or changed, or studded with atheromatous tracts. The most notorious cause of this is syphilis, but we are finding that not all aortitides are due to syphilis. On the other hand, a great many, and an increasing percentage each year, are due to rheumatic disorders, or even to strain such as that obtained in badly done athletics.

Aortitis may result in a diffuse enlargement of the aorta, or cause it to give way at one point and form a saccular aneurysm. That is, one or more of the coats of the aorta may give way allowing the other coat to dilate and we have a rounded mass varying in size from a small egg to that of an orange along the course of the aorta.

The aorta, of course, may become dilated and burst from other causes—such as arteriosclerosis and sudden strain, but in men under forty-five years of age the chief cause is syphilis. In older men it is usually arteriosclerosis.

The symptoms vary according to the localization. Thus aortic aneurysms are liable to produce a burning pain, cough, shortness of breath, and a feeling of weight under the breast bone.

Localized inflammation or degeneration of the peripheral arteries results in so obstructing the blood-current that increased flow such as would be needed for increased muscular effort is impossible. This usually occurs in the legs. Such a disease is called thrombo-angiitis obliterans, because it seems to be due to the formation of clots on the walls of the artery. Intermittent limping or claudication may result from such a cause.

The treatment of aneurysm calls first for rest. This usually demands extraordinary care of the digestive tract and regulation of the diet. Then the underlying disease must be looked after. The outlook is so bad that one can hope for improvement only after months of careful treatment. Even then sooner or later a strain will come sufficient to burst the weakened walls of the aneurysm.

Diseases of the Veins

Just as the arteries have dilations which are called aneurysms, so the veins have dilations which are called varicosities, or varices, or varicose veins.

But in the veins these dilations seem to be due to the weight of the blood-column as well as to disease. They are present, therefore, in people who stand much or who wear tight bands about the legs. These varicose veins cause trouble in the overlying skin (eczema), or even "ulcerate" through, causing the ulcus cruris or varicose ulcer.

The *treatment* is surgical. The dilated veins are either cut out or tied off. Until that can be done elastic bandages will relieve some of the distress.

CHAPTER XXVI

DISEASES OF THE GENITO-URINARY TRACT

THE kidneys are the most important organs of excretion for the waste material coming from the combustion of tissues. That is, the bowel throws off the unused foodstuffs, the lungs throw off the carbon dioxid, the skin

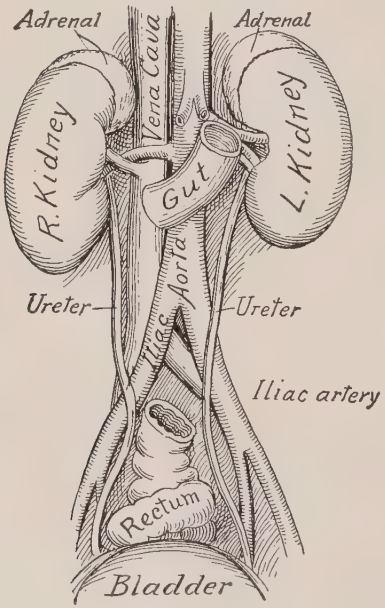

Fig. 46.—Anatomy of urinary tract.

throws off some substances that are soluble in the perspiration, but the great bulk of the nitrogenous products and salts are carried off through the kidneys. Consequently, the kidneys are subjected to great strain in all cases where there is either a wastage or destruction of a

great quantity of body tissue or where the individual eats more than he can utilize. Then, too, the kidneys have to bear the brunt of excreting the bacteria, their toxins, and other poisonous substances that get into the circulation. Consequently, the kidneys sometimes become infected from tubercle bacilli or streptococci which comes through the blood-stream from the respiratory tract.

Because of the above, we find that death from kidney disease increases with age. Thus we find the following table:

Males, age.	Rate.
20–24	11
25–34	24.1
35–44	63.4
45–54	157.3
55–64	368.4
65–74	773.1
75 and over	1587.9

In 1922 there were 94,680 deaths, a rate of 103.2. In 1923 the number of deaths was 101,759, a rate of 104.9. Of these, 52,880 were in males and 47,223 in females. These figures are for the non-venereal diseases of the genito-urinary tract.

But in such enumerations one must remember that it is difficult to separate out heart disease from kidney disease because the heart disease leads to kidney disease and vice versa. One might call them cardiorenal diseases instead of either kidney or heart diseases. Then also among children deaths are frequently attributed to kidney disease when it would be more accurate to say that they are due to scarlet fever or other infectious diseases that brought on the nephritis. But, be that as it may, the census reports would indicate that the diseases of the kidney are one of the most important causes of death in the United States.

Richard Bright was the first to publish (in 1828) a complete study of the pathologic conditions of the kidneys

and their symptoms; and it has, therefore, come about that any disease of the kidney, whether acute or chronic, is called by the laity Bright's disease. The medical world uses the term "nephritis" to cover the inflammation of the kidney, "nephrolithiasis" for stone in the kidney, "pyelitis" for an abscess in the pelvis of the kidney, and "nephrosis" for a degenerative process.

Fig. 47.—Effect on kidney and ureter of partial obstruction of the ureter by a stone, 25 per cent. sodium iodid injected (Ockerblad).

Methods of Study.—First comes the chemical examination of the urine. We examine the urine for albumen, sugar, indican, bile, and other abnormal contents. The routine examination usually limits itself to albumen, sugar, and indican. The examination for albumen is usually made by the aid of heat which precipitates the albumen. Another examination is by the use of nitric acid, which also precipitates the albumen. We examine for the presence of sugar by using a solution of copper, from which

the copper is thrown down and forms a yellow, copperish precipitate by the addition of heat whenever there is sugar present in the urine. This appears easily discernible because the test solutions are ordinarily blue, and after heating and the addition of a few drops of urine containing sugar become yellowish. Indican is looked for in a similar way. The indigo bodies are precipitated by the use of hydrogen peroxid, and then precipitated by chloroform.

Fig. 48.—Pyelo-ureterogram of a case of horse-shoe kidney; 25 per cent. sodium iodid injected (Ockerblad).

The microscopic study of the urine (usually after centrifugalization) shows the presence of casts and pus. Casts are due to disease of the kidneys themselves, but the pus may come from anywhere along the urinary tract.

The physical examination of the urine is to determine its specific gravity. This may vary from 1010 up to 1030, but we expect ordinarily a normal individual to pass urine showing a specific gravity of 1015 to 1020. The

quantity of urine needs also to be determined in many cases. When this is done, there should be a note made by the nurse as to the amount of fluid taken by the patient in order that a comparison between intake and output may be made. The odor of the urine should also be noted.

The acidity of the urine, or its alkalinity, is determined by the use of litmus paper, or by titrating the urine against a known standard just as phenolphthalein.

In many cases it is necessary to have *x*-ray studies of the genito-urinary tract made to determine the presence or absence of calculus and deformities. This is best done in connection with a cystoscopic examination in which instruments are passed into the bladder, and the bladder walls viewed directly through the lenses after being lighted by electric lamps. Catheters which show in the *x*-ray are then introduced into the ureters and the study of the flow of urine from each ureter determined as well as the patency of the ureters. After this is done there is injected into the suspected side some substance like sodium iodid or sodium fluorid and an *x*-ray of the whole tract made, which shows deformities as well as changes in position.

Nephritis.—Acute inflammations of the kidney are accompanied by pain and albuminous or even bloody urine. Usually the urine becomes scanty. It may be even entirely suppressed. The systemic (or secondary toxic) effects are nausea, vomiting, headache, etc. There may be edema of various parts of the body, including the uvula and glottis.

The prognosis depends upon the underlying cause and the general condition of the patient. Thus in the acute infectious diseases of childhood, if the patient were in excellent condition at the onset of the disease, the outlook would be better than if the child were already weakened by malnutrition or anemia. But in any case the outlook is grave because even in case of recovery a chronic weakness of the kidneys is apt to result.

The diagnosis is made from the examination of the urine. And since early diagnosis is desirable, frequent examinations of the urine in cases of infectious diseases are important.

Chronic inflammations of the kidneys may begin without a preliminary acute attack. They then begin so insidiously that the patient does not realize the character of the trouble until it is fully developed. Dyspepsia is frequently the first intimation that something is wrong. Then there is frequently headache and finally swelling of the ankles.

The urine may be either abundant and of low specific gravity, or scanty and of high specific gravity. The former is found in the interstitial type, the latter in the parenchymatous. Albumin is present in both types. The presence of casts is usually deemed of greater diagnostic value than the albuminuria.

The older classification was: (*a*) Chronic parenchymatous, and (*b*) chronic interstitial nephritis. Of late there has been a tendency to subdivide these inflammatory conditions into smaller groups, but for practical purposes the grouping advocated by Major seems sufficient, viz.: (1) Nephrosis or degenerative Bright's disease, (2) arteriosclerotic kidney disease, and (3) glomerular nephritis. Practically, all forms of chronic inflammation have in common an irritation or poisoning of the kidneys by substances that are being excreted with the urine. Therefore the kidney disorder in such cases is usually secondary to disease elsewhere or to irritant substances taken in with the food or drink. This disturbance of the kidney function leads to the retention within the body of many substances which a normal kidney would excrete. Among such substances are the end-products of the metabolism of proteins, urea, ammonia, etc.

The retention of waste products produces a saturation of the tissues with these poisons—that is, uremia. The initial symptoms of uremia are in some patients headache and malaise, in other patients, vomiting and diarrhea, in

others, asthma. If unrelieved, uremia leads to delirium and coma. Such a result may be reached only after months of sickness, but occasionally the course is rapid. The breath of uremic patients usually smells of urine, the color of the skin is pallid, and it feels pasty. There may or may not be an accompanying edema.

Treatment.—But all inflammations do not affect the kidneys alike. Some decrease the power to excrete nitrogen, others the salts, and still others ordinary water. Therefore, we have to test the efficiency of the kidneys and base our treatment on the results of the tests. In some cases we remove foods containing creatinin from the diet, in others give a salt-poor diet, and in others cut down the fluids.

The treatment, otherwise, is to relieve the body of these toxins. So we stimulate the other emunctories, as the excreting organs are called: the skin by causing perspiration; the bowels, by using cathartics; and even the lungs by causing deeper respiration. At the same time the tissue combustion is decreased by putting the patient to bed and feeding him the simplest of foods.

The amount of solids excreted daily must be watched, as the index of the nutrition of the patient as well as of the efficiency of the kidneys. Of urea the urine of a healthy man should contain daily not less than 12 grams. This represents 85 to 90 grams of protein food. A healthy man excretes from 13 to 17 grams of sodium chlorid daily, although his actual need probably does not go much above 3 grams; hence, it is not the amount of fluid excreted, but rather the amount of solids that shows whether waste products are being retained in the system or not. Of course, in studying these amounts one must take into consideration the amount of food ingested before deciding whether or not the bodily equilibrium is being maintained.

In parenchymatous nephritis, with scanty urine and edema, the reduction of the amount of fluid allowed the patient has a beneficent effect on the edema as well as

on the quantity of urine, decreasing the former and increasing the latter. The minimum amount of fluid pro die is 1500 c.c. (3 pints). This takes into account the fluid in the food as well as that in the beverages. Not only is the fluid output increased, but the work of the heart is lightened under this reduction of fluids in appropriate cases. In this way the dry diet fulfils all the conditions laid down for the treatment of such cases.

Where the heart is laboring and the kidneys seem unable to handle the excretion of the ordinary dietary products, the pure milk diet is indicated. That is, $2\frac{1}{4}$ to 3 pints of milk diluted with sodium citrate, sodium bicarbonate, or Vichy water is the standard prescription for the adult. This diet gets rid of the excess of chlorids and similar irritants, but will not do for all cases or for any length of time, because it does not furnish sufficient heat energy (calories) to maintain the body in equilibrium. Thus, a man of 125 to 150 pounds needs some 2400 calories of heat energy. This would require the ingestion of some $3\frac{1}{2}$ quarts of milk. Not only would this amount of milk be objectionable on account of the amount of fluid, but also on account of the amount of protein thereby thrown into the body—137 grams of albumin or 22 grams of nitrogen—that is, an amount double what is needed to maintain the protein balance.

To obviate the difficulty von Noorden gave a milk-diet made up of 1500 c.c. of milk and 450 c.c. of cream. This amounts to 2100 calories and 55 grams of protein. The heat energy is found in its 70 grams of sugar and 165 to 170 grams of fat. This diet does well for those convalescing from acute nephritis and those suffering from parenchymatous nephritis.

Forchheimer used for similar reasons the following diet:

	Calories.
Oatmeal jelly, made from 120 grams (4 ounces) of oatmeal	932
Milk, 1000 c.c.	893
Sugar	205
	2030

Milk is also poor in iron, hence, for this reason also, a simple milk-diet will not do for any length of time. On the other hand, milk is rich in phosphorus, and phosphoric acid is difficult for the kidneys to excrete. Hence, when giving an exclusive milk-diet, one should add calcium carbonate or similar substance to precipitate the phosphoric acid in the intestine—*e. g.*, 20 grains calcium carbonate t. i. d.

Many suggestions have been made for diets giving all the advantages, but none of the disadvantages, of the pure milk-diet. Thus Gouget prescribes 2 liters of milk, 250 grams of rice, 250 grams of grapes, and 750 c.c. of Vichy water. Arrow-root and sago may be substituted for the rice.

Now, in any form of nephritis where there is great edema it has been found that a diet poor in chlorids brings about a reduction of the edema. Hence, a milk-diet is advantageous in dropsy for this reason also. The following are illustrative diets (Achard and Widal) that contain less than 2 grams of sodium chlorid[1]:

[1] To ascertain the salt content of an ordinary diet the following figures will be useful. The following foods contain per kilogram:

	Grams of salt.
Milk	1.15
Butter	1.0
Eggs	1.5
Rice	0.1
Potatoes	0.5
Oatmeal	0.4
Peas	0.6

Cooking vegetables in pure water reduces their salt content 1 part in 1000.

1. Milk	1000	This affords 2274 calories
Potatoes	300	
Eggs	2	
Meat	300	
Barley	200	
Sugar	50	
Butter	40	

(*For continuation of foot-note see page 333.*)

In nearly every case of nephritis we must forbid the use of more than 100 grams of protein pro die (= 25 of urea). So also should we forbid all alcoholic drinks, spices, caffein, and nicotin.

In the regulation of the patient's activities we must also seek to spare the kidneys and circulatory apparatus, hence patients suffering from nephritis must avoid great exertion, both of mind and body. They must take life easy; they must not confine themselves indoors, but must lead a varied existence, seeking as much as possible of gentle out-door exercise.

The patient's clothing should be planned with the idea of preventing chilling. So, for example, it is well to wear light porous (loose mesh) underwear and to meet

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2. Bread (made without salt)....	200	
Meat.....	200	
Legumens.....	250	This affords 2200 calories
Butter.....	50	
Sugar.....	40	
3. Potatoes.....	1000	
Meat.....	400	This gives 3132 calories
Butter.....	80	
Sugar.....	100	
4. Potatoes.....	1000	
Meat.....	300	(2595 calories)
Butter.....	50	
Rice.....	125	
5. Bread (made without salt.....	500	
Meat.....	400	(3037 calories)
Butter.....	80	
Sugar.....	100	
6. Bread (made without salt).....	200	
Potatoes.....	700	(2450 calories)
Milk.....	50	
Butter.....	1000	
7. Bread (made without salt)....	200	
Potatoes.....	300	
Rice.....	100	(1889 calories)
Sugar.....	100	
Butter.....	25	

changes in temperature by wearing heavy wraps. These, of course, must be of the sort that can easily be removed on entering warm rooms; for some of the worst chilling comes from having become "sweaty" and then going into the outer air again. The material of the clothing is not as important as the mesh and its power of absorption; hence, the linen, the loosely woven cotton, and the silk seem to be just as satisfactory as the woolen undergarments.

To promote excretion through the skin cabinets heated by gas flame or electricity seem most easily used. Bedridden patients may be treated in bed by erecting a hot-air chamber over the bed by means of poles and blankets. Or they may be treated with "hot packs," by wrapping them in blankets wrung out in hot water. Such blankets need to be changed every three to five minutes. The usual duration of a bath is thirty to forty-five minutes. To promote increased excretion through the bowels, saline and mercurial cathartics are employed. Thus calomel given once a week in a dose of 2 to 3 grains has proved its worth. Epsom salts also finds frequent use. Two to four actions of the bowel daily are sought, if relief to the kidney is to be obtained.

When abscesses are formed in the kidney substance or its pelvis we have a **pyelonephritis** or a **pyelitis.** In the former case it is usually necessary to incise the kidney and insert drainage-tubes. In the latter case the treatment usually accorded to nephritis plus the administration of antiseptics is sometimes effective. The infection is derived either from the bladder (as, for instance, after catheterization) or from the blood-stream (as in septicemia, typhoid, etc.). The most common agent is the colon bacillus, but tuberculosis, typhoid, and similar diseases may be present. In addition to the administration of antiseptics, many physicians now administer vaccines made from the organisms cultured from the urine, and thus render the whole body immune to those species of bacteria.

Stone in the kidney (nephrolithiasis) demands, of course, surgical interference. It may have started in an infection which changed the character of the secretions and caused the salts normally held in solution to be precipitated and a concrement or calculus formed. Such a concrement may pass for years unnoticed until its size causes it to block up the ducts, or a concomitant inflammation weaken the whole kidney, or until it break loose and try to travel down the ureter. This latter gives rise to *renal colic*. In this the pain is so excruciating that atropin and morphin must be used in heavy doses. At the same time heat must be applied over the region of the kidneys. Renal colic may also be caused by a spasm of the ureters when there is no stone present, but simply a chill or an abrasion of the mucosa.

Inflammation of the bladder, or **cystitis,** usually comes up from below, and rarely down from the kidney. It gives pain and fever, and renders the urine alkaline. Practically always of infectious origin (*i. e.*, from gonorrhea, tuberculosis, etc.) it demands irrigation with antiseptics (*e. g.*, potassium permanganate, 1 : 4000) through the urethra, and also the giving of antiseptics by the mouth to keep the ureters free from infection. Antiseptics for this latter purpose are salol, hexamethylenamin, methylene-blue, and hexyl resorcinol.

Vigorously treated, a cystitis should give way in a week or two. The patient, of course, must be kept quiet, as in disease of the kidney itself.

Among the functional disorders of the urinary tract is **enuresis.** This is the inability to control the urine. It sometimes means the passage of urine without the patient's knowledge. Thus in young children we frequently find bed-wetting due simply to the fact that the child has never learned to control the sphincter muscles or that the tissues have not learned to notify the brain that there is need for emptying the bladder. In those cases the enuresis is a matter of education and requires very

definite impressive instruction on the part of the parents or nurses. But in many cases enuresis may be due to some irritation in the urinary tract, such as the reflex irritation from pin-worms or from the hooded clitoris in the female or from a long prepuce in the male. Even habitual indigestion may cause enurèsis.

The necessity for getting up at night to empty the bladder (nocturia) becomes more frequent in older people. In general, it may be said to be due to an irritation of the urethra or some part of the urethra. Thus, in the male it is most frequently due to prostatitis or vesiculitis. In females it may be due to an inflammation of the bladder, or cystitis. The treatment, therefore, follows the treatment of the underlying cause.

Urgency during the daytime, that is, inability to hold the urine may be due to general nervousness; that is, a heightened excitability of the nervous system; or it may be due to some defect in the sphincters; or it may be due to some trouble in the spinal cord where the centers controlling the sphincters are located. Still, again, it may be due simply to the irritant quality of the urine itself. For instance, when the urine is too acid we have this frequency of urination, or pollakisuria.

The inability to start the urine promptly is found in tabes dorsalis, or locomotor ataxia. That is, it is due to the weakness of the nerve-centers controlling the muscles used for forcing out the urine. Dribbling of the urine may be due to the same cause, but in males also to the development of strictures within the urethra. Such strictures are usually due to scars formed from old inflammations, such as those following gonorrhea.

Every kidney is more or less movable because it is held in place simply by cushions of fat and the pressure of the surrounding organs. Patients suffering from the prolapse of the stomach and bowels (visceroptosis) have also usually very **movable kidneys** (Glénard's disease). So also do most of the people who have lost much weight or become

greatly exhausted. When such kidneys slip down far enough to kink their ureters or interfere with their blood and nerve supply, pains result. Ordinarily, a little rest is sufficient to relieve the pain. Then a bandage may be applied to support the kidney until the fat cushions can be restored. Only the worst cases need surgical treatment.

Prostatitis.—In the male the glands about the outlet of the bladder are frequently infected by the urine. Thus, following typhoid we find prostatitis or vesiculitis, or both.

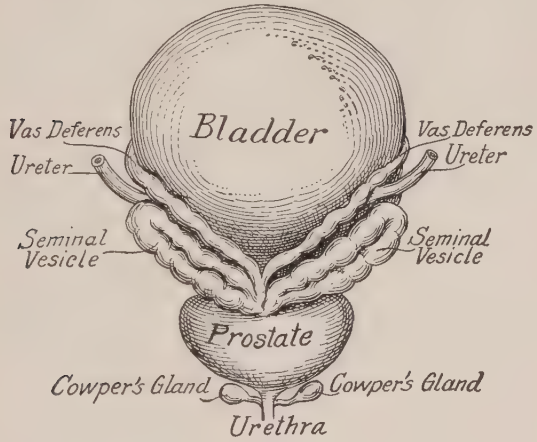

Fig. 49.—Relation of prostate to bladder.

So also in other severe colon infections we find both the prostata and the seminal vesicles infected. Probably a majority of the cases of prostatitis are due to gonorrhea. Vesiculitis is most common in the third and fourth decades. Later on the prostates of these men become enlarged and hardened and obstruct the flow of the urine. The treatment calls for frequent massage ("milking"), irrigation of the bladder, and the oral administration of antiseptics. The obstructive prostates should be removed if possible, otherwise it is necessary to use the catheter regularly.

This, however, almost always leads to an infection that helps shorten the patient's life.

Inflammation of the testes and epididymis (orchitis and epididymitis) in the scrotum are frequent and require differentiation from cystitis. Such inflammations may be due to gonorrhea, tuberculosis, mumps, etc. The danger is the destruction of the power to procreate, and the extension of the disease to the rest of the body. The treatment demands bed rest. Varicocele is a dilation of the long spermatic vein that reaches down into the scrotum. It does no damage except by its weight and discomfort. When necessary it may be removed by the surgeon without great danger. Urethritis is, of course, generally due to gonorrhea (q. v.).

The **female genital organs** are subject to like diseases: the inflammation of the ovaries and tubes and uterus, due to gonorrhea, mumps, etc. These require rest in bed—and only after this has been tried should surgery be resorted to. In enteroptosis the uterus and ovaries are kept irritated by the overlying mass of stomach and bowels. Here, again, instead of removing the ovaries, an effort should be made to support the bowels.

CHAPTER XXVII

THE ENDOCRINE GLANDS—DIABETES

Endocrine Glands

A GLAND consists typically of a group of epithelial cells which select from the blood-stream flowing along one side of them certain materials, and then either discharge these materials unchanged into the duct with which they are connected, or else work them over into a new compound and discharge this compound either into a special duct or back into the blood-stream. Thus, the large glands about the mouth manufacture from material taken from the blood, saliva, and discharge this through special ducts into the mouth. So also the kidneys take up water and urea, and various salts from the blood, and manufacture urine, which is then discharged drop by drop into the ureters and thence into the bladder. Again, the liver manufactures, among other things, bile, and sends this through long ducts into the intestine, a few fingerbreadths from the outlet of the stomach.

The other type of gland, namely, the ductless glands, and now called the endocrine glands, are represented by the thyroid gland in the neck; the pituitary gland at the base of the brain; the adrenal glands near the kidneys, the pancreas (internal secretion); the parathyroid on either side of the thyroid gland in the neck; the thymus gland just underneath the sternum and below the thyroid; the ovaries in the female, and the testes in the male, have internal secretions as opposed to external secretions. There are one or two other bodies that are sometimes reckoned among this group of endocrine glands, but whose work we are not sure of.

The **thyroid gland** seems to be the gland that energizes the body tissues, activates them, to use the physical term. Its active principle is called thyroxin, as named by its discoverer Kendall, of the Mayo Clinic. When the gland swells we have what is called goiter. But this does not always mean that there is an increase in the secretion of the glands. On the contrary, quite often the presence of a goiter indicates that the gland is not secreting as much as it ought to.

We find goiters in girls just after puberty and in pregnant women. These goiters are of the type that indicate

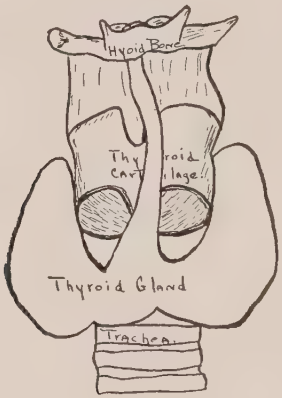

Fig. 50.—The thyroid gland.

the absence of sufficient secretions. They are the so-called colloid goiters. Sometimes they disappear after the body has resumed its normal course. Somtimes they remain throughout life.

When the thyroid gland secretes too much we have symptoms of nervousness. The fingers show a tremor. The heart beats too rapidly. There is apt to be diarrhea. There is increased sweating. The patients do not sleep well. They are so active and restless that they must be

constantly in motion. And with it all they grow thin in spite of an enormous appetitie.

A variation of the type of hypersecretion is that known as exophthalmic goiter, or Graves' disease, or Basedow's disease. In this form the eyes bulge out, exophthalmos, and there are signs of increasing weakness as well as the emaciation and nervousness noticed with other forms of hyperthyroidism. This form of the disease is as yet little understood, and it seems to have sometimes a regular course and be self-limited. But in most cases it requires operation for removal of the excess gland, even though the results are not always as good as one would desire.

The conditions brought about by deficient thyroid secretion vary according to the age of the patient.

Whenever the failure to secrete begins in adult life we have a condition called myxedema. The skin becomes dry, putty-like, the patient becomes lethargic, and all his functions act more slowly. When this lack of secretion is present from birth, we find the patients are dwarfed and feeble-minded and apply the term cretinism to it. For this includes not only the symptoms noted in myxedema but also a dwarfism and a backwardness of the mind. All these symptoms gradually disappear or at least are improved by the administration of the extract of the thyroid gland.

The goiter of adolescence can be prevented if one will feed growing children—say, from eight years on—a little iodid each year. Thus 2 grams of sodium iodid taken every six months seem to prevent the development of these adolescent goiters.

It is interesting to note that there is such a thing as endemic goiter. For example, certain parts of the United States and of Switzerland are noted for the number of goiters that one sees. These areas seem to be sharply demarcated and the geologists tell us that they are the places where the water and the vegetation contain little or no iodin.

Endemic goiter is usually benefited by change of residence. Therefore, it is quite proper in case of most enlargements to try a change of climate before proceeding to more vigorous measures.

In giving thyroid extract (as the dried gland of sheep is usually termed) we should try to give it on an empty stomach. Then no food should be taken until it has passed out of the stomach—at least a half-hour. It is the author's practice to prescribe it for 10, 4, and 9 o'clock, with a little water. The purpose of all this is to prevent the digestion of the extract by the gastric juices—as would occur at mealtime.

Addison's disease is a degeneration or disease of the adrenal bodies (also called the suprarenal glands), located just above the kidneys. This is caused by a tuberculous process attacking the gland. The symptoms are chiefly a brownish pigmentation of the skin, a general weakness, and very pronounced digestive disturbances. We know that these general symptoms are due to a lack of the adrenal secretions in the blood. Therefore, the treatment appears very simple: that is, feed the patients with adrenal extract taken from animals. But unfortunately in practice it seems very difficult to substitute this artificial supply adequately and permanently.

Other conditions seem to exhaust the adrenals, and we then have a hypo-adrenia with some of the same symptoms as in Addison's disease.

For example, we find general weakness and digestive disturbances particularly marked.

The adrenal secretion seems to energize the body tissues similarly to the thyroid, but much more quickly and for a much shorter time. Thus we know that in anger and fear and hate there is an increased supply of the adrenal extract in the blood-stream. This makes possible quicker action of the muscles as well as the energizing of the rest of the body.

Acromegaly seems to be due to a disease of the pituitary

gland, a small body lying just underneath the brain in the skull. Its chief symptom is an abnormal enlargement of the bones, particularly of the jaw. Next in frequency

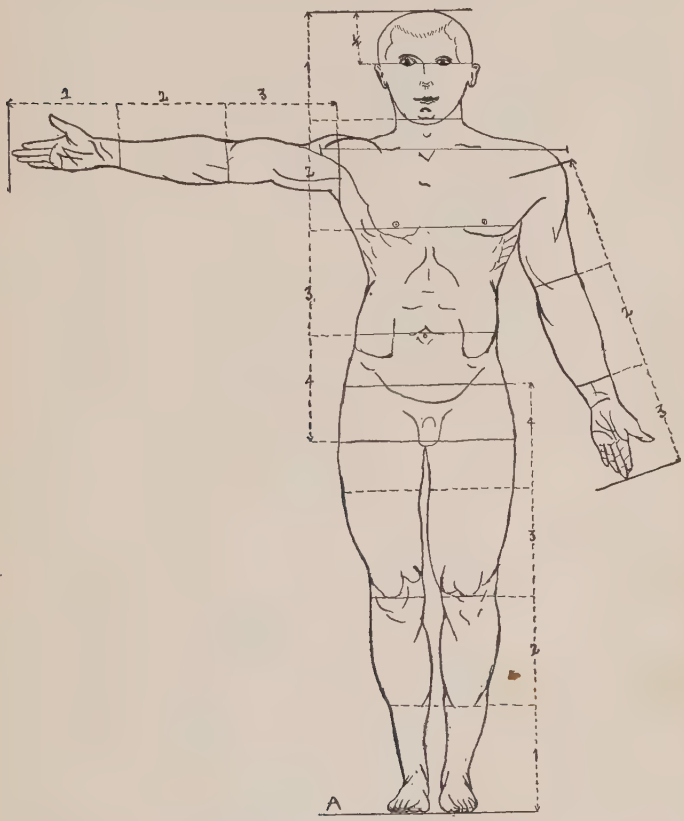

Fig. 51.—Normal bodily proportions, using the head as the unit of measure: *A*, The figure as a whole.

comes the enlargement of one or both hands, then of the feet. The overlying tissues appear normal, but thickened. The mentality is slowed and the patients are frequently

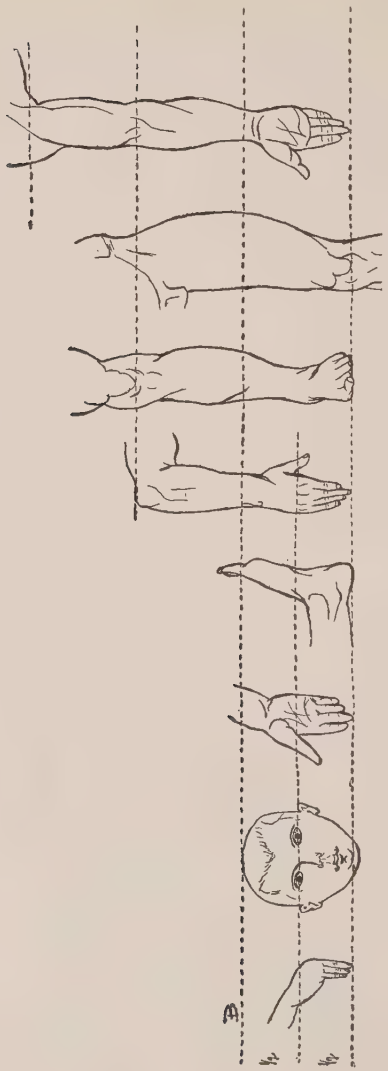

Fig. 52.—*B*, Details of the extremities.

noted for their sleepiness. The usual explanation is that the pituitary becomes abnormally active and produces this bony overgrowth and then burns itself out, and the patient is left with less energy than he started with.

The pituitary gland has two parts: the posterior and the anterior. The secretion of the former raises the blood-pressure and stimulates smooth muscle. This may result in abdominal cramps and a bowel movement some forty-five minutes after its injection. The posterior extract is used also to expedite the contraction of the uterus at childbirth.

The secretion of the anterior part of the pituitary stimulates growth. Therefore we use it in cases of infantilism—*i. e.*, cases of arrested development.

There is a type of obesity due to the lack of pituitary gland secretion. This is characterized by great folds of fat hanging like an apron down from the abdomen. The patients are sleepy and quite lethargic in every way.

We find that pituitary extract is of use in arresting diabetes insipidus—that form of diabetes in which there is an excessive quantity of water excreted. It has to be given by the needle once or twice a day to keep the patient normal.

The **thymus** is a mass of tissue lying just underneath the upper part of the breast bone (manubrium sterni). It is largest in infancy. Sometimes it is so large that it presses against the windpipe and obstructs the breathing (thymic asthma). Sometimes it gives off a toxic secretion that weakens the heart (thymic death), and sometimes there is a lack of secretion, in which case the bony growth is retarded and the skin not smooth. The gland atrophies so that in adult life it is active only under unusual conditions.

The **"change of life"** (climacteric or menopause) in women is due to the cessation of the activity of the ovaries,

so that other endocrine glands must take over these functions. Sometimes this does not go smoothly and the patients suffer all sorts of nervous symptoms. These disturbances are in most cases cared for by the body itself, but sometimes aid must be given. This aid is usually in the form of glandular extracts, in particular, of the corpora lutea of the ovaries. This in conjunction with careful hygiene soon brings about a return to the normal. During these changes in glandular function (in which the thymus and thyroid as well as the ovaries take part) women should be as quiet as possible, in order to give the body full strength to deal with the heavy task.

The sex gland secretion is called gonadial secretion and has an influence in determining the vigor or virility or femininity of the patient. It is quite the fashion in these days to give these extracts to help stimulate the activity of worn-out and exhausted people.

The internal secretion of the pancreatic gland is called insulin. This has the function of controlling the utilization of the sugars and starches. When, therefore, this is lessened we have the symptoms of diabetes mellitus. When the secretion is too great we have a nervousness and a need for extra meals. Inasmuch as diabetes mellitus is a disease of great importance and seemingly on the increase we will devote some time to its special consideration.

Diabetes Mellitus

The death-rate from diabetes mellitus per 100,000 in 1910 was 14.9. In 1920 it was 16.1. In 1925 it was 16.9. It seems, therefore, to be on the increase.

The disease is more frequent with the increase of age. For example, under twenty-five years there is little diabetes. This perhaps is better illustrated by a table from the Census Record.

Years.	Rate per 100,000.
1– 4	2.2
5– 9	3.0
10–14	4.2
15–19	4.8
20–24	4.8
25–34	5.6
35–44	8.6
45–54	22.6
55–64	57.4
65–74	95.0
75 and over	112.8

In general, women show a higher rate than men, and white than colored. The Jews seem to be more often affected than the Gentiles, but probably this is due to the tendency to obesity on the part of the Jews. At any rate overly-fat people are the ones most frequently attacked.

The predisposing causes of the disease are exhaustion and focal infection. We find also some cases of gall-bladder disease showing lessened sugar tolerance. Of late years one sees many cases of diabetes develop after attacks of influenza.

Glycosuria, or presence of sugar in the urine, is a symptom of diabetes mellitus. But glycosuria may be present without there being present a true diabetes. In fact, one finds a lessened tolerance for sugar, that is, the threshold for the excretion of sugar through the kidneys is lowered in conditions of fatigue and exhaustion and nervousness, and also when there is injury to the base of the brain (or the floor of the fourth ventricle, to be more exact).

The symptoms of the disease are weakness, dry and itching skin, intense thirst, with the consumption of a great increase of water, intestinal upset, diarrhea, sometimes constipation, an increase in the quantity of urine, etc. Therefore, in spite of the intense appetite and thirst the patient still loses weight. And this after a while becomes so noticeable that he goes to the doctor who finds sugar in the urine.

The prognosis of the disease is bad as far as the return to normal is concerned, but fair as to life. The patient must learn how to calculate his calories, and must learn how to select his food. If he learns to do these things, he probably will not die at all from diabetes. And now that we have insulin we find that a great many people recover the ability to handle fairly normal amounts of sugar.

The patients who die, die usually from diabetic coma. This is due to the inability of the body to burn up the fat, because of the absence of sugar. Therefore, the body is poisoned with a condition we call acidosis. In this condition we find acetone and diacetic acid in the urine. To prevent acidosis diabetics need to use sufficient carbohydrates to burn up the fats in their diet. The amount necessary to do this has been established by recent researches as lying between $\frac{1}{4}$ to $\frac{1}{3}$ of a gram of sugar to each gram of fat.

Another great complication of diabetes is gangrene of the toes and feet. This is to be avoided by extreme cleanliness and frequent exposure to the air. Skin infections are also frequent. That is, furunculosis is common, and carbuncles may prove fatal.

The treatment of the disease demands first of all that the patient's tolerance for sugar be learned. This is done best by ascertaining the blood-sugar level, and using this as the guide for the establishment of a maintenance diet calculated according to the weight and height of the patient. The maintenance diet is just a sufficient amount of food to keep the patient in fair health if he is quiet; but it is not enough to take care of the patient if he works. One system for calculating the maintenance diet is this: the weight of the body in kilograms is multiplied by 30 and divided by 40. The resulting figure is the number of grams of carbohydrates that the patient should take care of. Twice this amount is used of protein, three times this amount is used of fat. But many people cannot take care of this amount of fat or this amount of protein, and,

therefore, no set formula can be used for all patients. The best way, therefore, nowadays, is for the patient to enter the hospital and be carefully standardized before he attempts to diet himself.

It is essential that one know the carbohydrate content of the food that he is going to use. The cards worked out by Joslin are of great help.

In general, one learns to live on the vegetables and fruits rather than on the grains and the starchy foods. In other words, it is wiser to cut out from the diet potatoes, breads, baked beans, and all that sort of thing, and to live on the leaf and root vegetables which contain little carbohydrate. When a patient cannot take the maintenance diet without showing sugar, insulin is injected under the skin. It should be remembered in this connection that 58 per cent. of the proteins are made over into carbohydrates after being ingested in the body. Since insulin is injected hypodermically, patients who must have it have to be taught how to do this under aseptic precautions. In general, one tries to limit the number of injections each day to the fewest number possible. Ordinarily one can get along with only two injections, and sometimes with one.

When one gets too much insulin, then there are symptoms of nervousness, twitching, and sweating. This calls for the administration at once of sugar in some simple form, such as orange juice, or even sweet milk. But the feelings of the patient should not be used as a complete guide in this matter, but should be supplemented by studies of the blood-sugar level. The blood-sugar level bordering on the subnormal is .07. The normal blood-sugar level is 0.10, and 0.16 is regarded as the upper level of the normal. When, therefore, the blood sugar gets below .07, we may have the symptoms of hypoglycemia. When the level reaches above 0.16 we may have the symptoms of hyperglycemia. In the first case we administer sugars; in the second case we take sugars away or give insulin.

Diabetic coma is caused, as we have indicated above, by an acidosis. The patient may be unconscious, and serious errors may arise for he might be suffering from many different diseases. The nurse can get a lead on the matter by the breath of the patient which, in acidosis, exudes the aroma of ripe fruit. In diabetic coma the first thing to do is to inject insulin, using from 20 to 40 units. Caffein may be used to stimulate the patient, and salt solution given by rectum may be of help. The patient is catheterized and the urine studied from hour to hour as to the presence of sugar. The insulin is given in accordance with the result of the findings.

From Joslin's clinic comes the statement as to the use of insulin in coma like this: "The size of the first dose of insulin in coma depends upon the doctor's estimate of the probable number of hours the patient can live without insulin. If the patient's expectation of life is twenty-four hours, one would inject 20 units and repeat every hour until clinical improvement and the sugar in the urine or blood is approaching normal. If the patient's expectation is twelve hours, one would inject 40 units and repeat the dose in the same manner, changing the quantity to 20 units as the state of the patient indicates. But if the expectation is only six hours, one would inject 40 units every thirty minutes until improvement is manifest."

The prevention of diabetes should occupy the attention of every family. Prevention lies along the line of reducing the amount of carbohydrate in the diet. The amount of sugar used in the United States is too great, as we realize when we remember that a hundred years ago about 9 pounds of sugar per annum was used by each person in the United States, and that now the amount is 112 pounds or greater. This is so much that it requires only a bit of exhaustion from disease or from overwork to make the body unable to take care of the sugar. This is another reason why it is unwise to rear babies and children on candies, ice cream, and other sweets.

Another condition, that of obesity, should be watched for. In general, when patients are 20 per cent. above the standard of weight according to height and age, it is wise to reduce the weight by appropriate dietaries and, if necessary, by the use of drugs.

Diabetes Insipidus

Diabetes insipidus is a disease sometimes confused in the popular mind with diabetes mellitus. It is a mild disorder, but very annoying. It is characterized by the passage of great quantities of urine, sometimes gallons daily and by a corresponding thirst. It is found chiefly among young men.

It is probably due to some disorder in the tissues near the base of the brain, for the administration of pituitary extract seems to be able to overcome the attacks and bring the urine back to normal. Otherwise nothing can be done for it except to keep the life of the patient as hygienic as possible. Fortunately, there are no fatalities from it.

The Food Content of Various Articles of Diet

		Carbohydrate	Protein	Fat	Calories
FRUITS					
FRESH					
Cranberries, Blackberries, Grapefruit, Lemons, Mushmelons, Oranges, Peaches, Pineapple, Strawberries, Watermelon	Contains (On average)	10	1	0	44
Apples, Apricots, Pears, Raspberries	Contains	15	1	0	64
Bananas, Plums, White Grapes	"	20	1	0	84
CANNED					
Variable in carbohydrates from 15% to 25%, depending on density of sugar solution used. Fruits canned without sugar may be calculated the same as stewed fresh fruits.					
DRIED					
Apricots	Contains	62.5	4.7	1	277
Dates	"	70.6	1.9	2.5	312
Figs	"	74	4.3	0.3	315
Prunes	"	62.2	1.8		256
Currants	"	74.2	2.1	1.7	321
Raisins	"	76	2.6	3.3	344
PRESERVED					
Variable in carbohydrates from 50% to 80%, depending upon concentration in sugar.					
NUTS					
Almonds	Contains	17	21	54	638
Brazil Nuts	"	7	17	66.8	697
Chestnuts	"	42	6.2	5.4	241
Cocoanuts	"	17.5	3.6	31.7	369
Peanuts	"	24.4	25.8	38.6	548
Peanut Butter	"	17	29	46	598
Pecans	"	13	11	71	735
English Walnuts	"	16	16	63	695
Black Walnuts	"	11.7	27.6	56.3	664
PROTEIN AND FAT FOODS					
1 Egg	Contains	0	6	6	78
1 Egg Yolk	"	0	2	6	62
1 Egg White	"	0	4	0	16
Cream (20% fat)	"	5	3	20	212
Milk (whole)	"	5	3	4	68
Milk (skimmed)	"	5	3	1	41
Cheese (American)	"	0	30	36	444
Cheese (Cottage)	"	4	20	1	105
Butter	"	0	1	85	769
Lard	"	0	0	100	900
Oils (Salad)	"	0	0	100	900
FISH AND MEATS					
Crabs	Contains	1.2	16	2	86
Lobster	"	0.4	16	1.8	81
Oysters	"	4	6	1	49
Frogs' Legs	"	0	15	0.2	61
Cod (salt)	"	0	25	0.3	102
Trout (lake)	"	0	17.8	10.3	163
Whitefish	"	0	22.9	6.5	150
Salmon	"	0	22	12.8	203
Halibut	"	0	18.6	5.2	121
Lamb Chops (raw)	"	0	18	28	324
Steak (raw)	"	0	20	13	197
Lean Meat (cooked)	"	0	25	15	235
Ham (raw)	"	0	16	38	406
Pork (loin)	"	0	16.6	30	336
Bacon (medium lean)	"	0	10	67	643
Chicken (broilers)	"	0	21	2.5	106
Chicken (fowls)	"	0	19.3	16.3	224
Turkey	"	0	21	22.9	290

The Food Content of Various Articles of Diet

		Carbohydrate	Protein	Fat	Calories
VEGETABLES					
Asparagus, Brussels Sprouts, Cabbage, Cauliflower, Celery, Cucumbers, Eggplant, Endive, Green Pepper, Lettuce, Okra, Mushrooms, Radishes, Rhubarb, Sauerkraut, Spinach, String Beans, Wax Beans, Swiss Chard, Tomatoes, Watercress	Contains (Reckon available carbohydrate as 3%)	5	1	0	16
Beets, Carrots, Horseradish, Kohl-rabi, Leeks, Onions, Pumpkin, Rutabagas, Squash, Turnips	Contains (Reckon available carbohydrate as 6%)	10	1	0	28
Parsnips	Contains	15	1	0	64
Peas	"	15	7	0	88
Corn	"	20	2	0	88
Lima Beans (Fresh)	"	22	7	0	116
Irish Potatoes	"	20	2.5	0	90
Sweet Potatoes	"	27	1.8	0	115
Green Olives (E. P.)	"	11.6	1.1	27.6	299
Ripe Olives (E. P.)	"	4.3	1.7	25.9	257
Pickles (Unsweetened)	"	2.7	0.5	0.3	15
CEREAL PRODUCTS					
Flour (Wheat)	"	75	11	1	353
Cellu Flour	"	0	0	0	0
Cornmeal	"	75	9	1	345
Cream of Wheat	"	76	11	1	357
Rolled Oats	"	66	16	7	391
Tapioca	"	88	0	0	352
Cornstarch	"	90	0	0	360
Macaroni	"	74	13.4	0.9	357
Noodles	"	75.6	11.7	1	358
Cornflakes	"	81	0	0	324
Puffed Rice	"	80	6	0	344
Grapenuts	"	75	11	0	344
Shredded Wheat	"	76	8	0	336
Popcorn (Popped)	"	77	10	5	393
White Bread	"	53	9	2	266
Rye Bread	"	53	9	0.6	253
Bran Bread	"	40	9	1	205
Soda Crackers	"	73	9	9	409
Graham Crackers	"	73	10	9	413
SUGARS					
Cane or Beet	"	100	0	0	400
Brown Sugar	"	95	0	0	380
Honey	"	81	0	0	324
Jelly	"	70	0	0	280
Marmalade	"	84	0	0	336
Lactose	"	100	0	0	400
MISCELLANEOUS					
Cocoa	"	37	21	28	484
Chocolate	"	30	12	48	600
Gelatin (Granulated)	"	0	100	0	400

CHAPTER XXVIII

DISEASES OF THE BLOOD

The normal blood contains about 4,500,000 to 5,000,000 red blood-cells and from 5000 to 10,000 white cells to the cubic millimeter. The red cells serve to carry the hemoglobin, which, in turn, carries the oxygen to the tissues; the white blood-cells seem to have another function that has more to do with the taking care of food-stuffs and antagonizing foreign material. The fluid in which these cells float, called the plasma of the blood, contains, of course, the nourishment for the tissues. Changes in the number of the red blood-cells are rare except in anemia. Changes in the number of the white blood-cells occur usually after each meal, and whenever anything disturbs the body's rhythm, whether it be exercise or hemorrhage or injury, or the absorption of poisons.

When a blood-vessel is opened and the blood oozes out, if it is normal it coagulates and stops the opening, that is, when the opening is not too large. But this power of the blood to coagulate is disturbed by malnutrition and other conditions of the body, and then injury to the blood-vessels is liable to produce excessive hemorrhage.

Thus, for example, in jaundice there is an increased coagulation time, that is, decreased coagulability of the blood. This coagulation is brought about by the formation of fibrin in the blood itself. So that after the blood stands a little while the fluid separates out from the clot. This clot, of course, contains the fibrin and blood-cells, while the serum which comes out on top of the clot contains chiefly the soluble matter of the blood.

Sometimes a clot forms inside of a blood-vessel. This is called a thrombus. It may be brought about by injury

or by disease of the wall of the vessel. Not only do these clots obstruct the lumen of the vessel, but they also may be dangerous in that pieces of the clot may break loose and go through the heart and to the finer vessels of the brain or to the lungs, and may shut off the flow of blood to that part of the body, producing what we call an infarct. Fortunately, however, when a vessel is plugged up by a clot the blood may pass around the obstructed vessel by the enlargement of small accessory vessels in that neighborhood. These form an anastomosis, as it is called, and enlarge gradually to meet the demands upon them.

The danger, then, from embolism (that is, the passage of blood-clots through the blood-vessels) depends on the tissue in which the infarct is formed. Thus if it be in the liver or a kidney it would cause simply pain and swelling. But if it be in a vital portion of the brain it would cause either apoplexy or death.

The Blood

The red blood-corpuscles are formed in the marrow of the bones. Some of the white blood-corpuscles are also formed in the bones, but other cells are formed in the lymphatic nodes or glands. Thus the polymorphonuclears are formed mostly in the marrow of the bones and the mononuclears in the lymph-nodes. The blood-cells seem to be destroyed or at least the broken-down cells taken up by the spleen, and to some extent by the liver. The hemoglobin of the destroyed cells seems to be taken up and excreted in the bile by the liver.

For these reasons irritation of the bone-marrow causes a disturbance in the cell count of the blood. It is probable, therefore, that some of the diseases of the blood should be called rather diseases of the blood-making organs, such as of the lymph-glands in cases of lymphatic leukemia, of the bone-marrow in cases of myelogenous leukemia.

After meals there is usually an increase in the number of white blood-cells circulating in the blood. This is called physiologic or alimentary leukocytosis. In some diseases there is a distinct increase in the number of these leukocytes or white blood-cells beyond that which occurs after meals. In other diseases, on the other hand, there is a leukopenia or a decrease in the number of white blood-cells. Consequently, the examination of the blood frequently gives us a hint as to the type of disease present. Not only is the total white count changed, but the relative proportion of the mononuclears (or lymphocytes) and the polymorphonuclears (or bone-marrow cells) changed. Normally, the percentage of polymorphonuclears is 65 to 75 per cent., while the mononuclears run 25 to 35 per cent. But in the presence of disease caused by pus-forming bacteria the number of polymorphonuclears increases up to 90 per cent. or more, and the total white count rises from 7500 to 15,000 or more. Consequently, it is necessary to make a differential count of the white blood-cells as well as a total white count before one can arrive at any definite interpretation of the "blood-picture." Other changes in the differential count occur, as, for example, in the percentage of eosinophils, or red staining cells. In conditions where we have asthma or intestinal parasites, such as the Tænia, we have an increase in the number of eosinophils.

The hemoglobin, or coloring-matter of the blood, is decreased in those forms of bodily disturbance where there is emaciation and waste of the tissues. It is also decreased in young women just after puberty if they are not provided with a sufficient amount of iron-containing foods to take care of the iron which is abstracted from the general circulation and stored up in the generative organs. The decrease in hemoglobin is shown by color changes in the blood. This occurs, of course, most frequently in the case of hemorrhage, especially in the

case of repeated hemorrhage. This loss of the coloring-matter of the blood is called anemia and is reckoned in the percentage using the normal as 100. For example, in chlorosis, that is, a disease of young females, we have an enemia with a hemoblogin percentage of, say, 70. Again, after a severe hemorrhage the hemoglobin may sink to 50 or 60 per cent. After acute rheumatic fever the hemoglobin is liable to fall to 75.

The red cells are decreased out of proportion to the hemoglobin in the so-called primary anemias. In pernicious anemia, for example, we find that each blood-cell is redder and carries more hemoglobin than normal. This relation of color to number of cells we call color index. The index, therefore, in pernicious anemia is plus one; that is, there is more hemoglobin in the blood than there are cells to carry it. But the distinction between primary and secondary anemia is merely a matter of temporary convenience because we have to confess that a primary anemia is one of which we do not know the origin or cause, while a secondary anemia is one in which we do know the cause. For example, for a long time cancer of the stomach gave us a blood-picture which we could not distinguish from that of the so-called pernicious anemia. So also among the hookworm sufferers of the South and West Indies we find a blood-picture almost the same as that in pernicious anemia.

Pernicious anemia is, therefore, a disease of the blood in which the number of red corpuscles is reduced lower than the corresponding amount of hemoglobin. It is a disease, as its name indicates, which ends ultimately in death. But it is characterized by a number of remissions wherein the disease seems to remain stationary and thus give the sufferer hope that he is going to get well. It is characterized also by having blood storms in which a shower of immature red cells are sent out from the bone-marrow and are so young that they contain the nuclei of

the red cells. The bone-marrow in this disease is red and inflamed, or when the bone-marrow is exhausted, yellowish and atrophied. The suspicion is that this disease is caused by some trouble in and about the lower part of the stomach and upper part of the bowel. But this is merely a suspicion that has not been proved. At any rate, with this disease there is usually absence of the free hydrochloric acid in the gastric secretions. Consequently, there is a lack of digestive ability. The tongues of the patients suffering from pernicious anemia are atrophied, glossy, smooth, instead of corrugated and with a deep mucosa. And the stomachs when examined after death show also an atrophy of the mucous membrane. The patients are very weak, they have lost many of their reflexes, which makes it appear as if there had been some disease of the spinal cord running synchronously with that of the blood. As indicated above, the disease leads to death after a few years. All sorts of treatment have been attempted, but the best that has been done so far has been to prolong the lives of the patients for a while. Of course, when focal infections or infestation with worms cause the syndrome, the removal of these causes will help the patient very markedly, even if it is too late to cure the disease.

In the census reports anemia and chlorosis are grouped together and the death-rate given at 5.5 per 100,000 in 1920, and 4.9 in 1910. In 1923 the number was 5867 and the rate 6 per 100,000. Naturally, we would infer that the most of these deaths were due to the primary anemias.

Chlorosis is an anemia of young girls about fifteen to nineteen years of age. The skin is waxy; there is great general weakness; and the patients, in spite of their weakness, look as if they might have considerable fat. This disease is rather rare among country girls, but used to be very common among the girls of the cities of Europe. The treatment is very satisfactory, for with six weeks

of bed rest and the administration of iron there is complete restitution of health.

Leukemia is a disease of the blood-making organs in which there appears in the circulating blood great numbers of white cells. In myelogenous leukemia one finds these cells to be immature bone-marrow white cells. And the numbers run up into the hundreds of thousands instead of 5000 to 10,000 as in normal blood. In that form of leukemia characterized by the presence of the small white cells, that is, lymphatic leukemia, we have numbers running from 5000 to 200,000. The patients are weak and perhaps weakness is their greatest complaint. Sometimes there are pains, especially if they have attacks of renal colic.

In general, we should say that there are two forms of leukemia—the acute and the chronic. In the acute form we have hemorrhages, especially from the mucous membranes, such as from the gums, and even some fever. Death occurs in from six to twelve weeks. While in the chronic form we have ordinarily no evidence of hemorrhage. The chief complaint is weakness and, in myelogenous forms, an increase in the size of the spleen and the presence of fluid in the abdomen so that the abdomen swells. There is usually a complaint of diarrhea or some upset of the digestive tract.

Leukemia has sometimes been called blood cancer, and it seems to deserve this title, although neither its neoplastic nor its infectious origin has been definitely determined. There are advocates of both theories. At any rate, the leukemias seem to be practically always fatal. The only therapeutic measures that have given much help are the extirpation of the spleen and the use of the *x*-ray and of arsenic and benzol to destroy the excess white blood-corpuscles. Until the origin of the disease has been somewhat more definitely settled preventive measures will, of course, be impossible.

There are several variations of these diseases, such as,

for example, Banti's disease, in which both the liver and spleen seem involved. But the general principles just stated govern their occurrence and results.

Leukemia showed a death-rate in 1923 or 1.5 per 100,000; in 1910, 1.6. Of the 509 deaths in 1923, 950 occurred in the cities and 509 in the country, a fact that may have considerable significance.

CHAPTER XXIX

DISEASES OF THE SKIN

Causation.—I. Constitutional:

1. Toxic, *e. g.*, ivy-poisoning.
2. Infectious, *e. g.*, rose spots of typhoid
3. Nervous, *e. g.*, diabetic pruritus.

II. Local:

1. Traumatic, *e. g.*, burns.
2. Bacterial, *e. g.*, furuncles ("boils").
3. Fungous, *e. g.*, ring-worm.

The above diagram shows how complex is the causation of skin diseases. It follows that routine treatment is liable to failure here more than elsewhere, but it is just in the realm of skin diseases that nurses are apt to imagine that they can dispense with the physician's advice and take care of the skin troubles themselves. And yet it is among these very lesions that we find the most obstinate of affections, the despair of the conscientious physician.

Eruptions are classified according to their form and contents. Thus, solid eruptions, whose height is greater than the base, are called papules; when the height is less than the base, macules. When the contents are fluid and clear, they are vesicles; when fluid, but purulent, pustules. Thus, the eruption of measles is usually macular; that of scarlet fever, papular; that of smallpox, first vesicular and then pustular. There are also many special terms applied by dermatologists, but the above are sufficient to enable the nurse to understand the doctor's comments and directions.

Most of the vesicular and pustular eruptions are caused by the presence of the fluid between the dermis and epidermis. In fact, the more solid appearing papules and

macules are formed in the same general way. For this reason the covering of these eruptions is without sensation and may be pierced without pain. Most of the pain and discomfort are due to the exposure of the nerve ends (that lie in the dermis) to the air or to the irritating serum collected in the eruption.

Furuncles differ from these eruptions in that their base usually lies below the skin and that in connection with some gland. Erysipelas and lupus are also diseases with a subcutaneous base.

Itching of the skin may be unaccompanied by any change in the appearance of the skin, at least any change visible to the naked eye. This is in accordance with the fact that the irritation may be in nerve-centers and not in the skin at all. Thus, in old people with dry skins there may appear itching so obstinate as to resist all local treatment, except that of deadening the nerves. This is exemplified by *pruritus ani* and *pruritus vulvæ*.

When the itching is accompanied by diffuse and irregular blisters or vesicles we have the "hives," or **urticaria**. This is a most exasperating affection, and may be due to nervous exhaustion, indigestion, sensitiveness ("allergy") to certain substances, and to local irritation. Its presence demands a careful analysis of accompanying signs and symptoms before anything other than palliative treatment be attempted. Such palliative treatment may consist of the application of a solution of sugar of lead (liquor plumbi subacetatis), a solution of baking soda, or of a solution of menthol and camphor in olive oil (from 5 to 10 per cent. of each).

If the cause be constitutional the patient should be put to bed, his bowels emptied with saline cathartics (*e. g.*, Epsom salts), and his food limited to milk and lime-water until the toxic substances have been eliminated from the body. Frequent recurrence of hives demands a careful investigation of the patient's metabolism; for in general there seems to be a lack of lime salts (Wright) accompany-

ing the trouble. Pruritus ani is usually due to some irritation in the area of the hemorrhoidal circulation, such as ulcers, prostatitis (in the male), and low-grade infections that stir up the glands around the anal margin. These glands then secrete an irritant fluid that keeps the skin inflamed. Similarly, the pruritus vulvæ can be traced to irritant secretions from the vagina. The need of causal treatment is, therefore, obvious.

Eczema is a broad term covering both hives and more chronic forms of skin troubles. It is, therefore, not definite in its significance. Thus, ivy-poisoning may produce a "weeping eczema," or only an urticaria or hives. So, also, a continued irritation, as that of rough clothing, may produce blisters and scales, that is, an eczema. Again, we find eczemas the result of poor food and hygiene, that is, of malnutrition. The treatment, therefore, is quite similar in principle to that mentioned above for urticaria: the soothing of the skin and the removal of the cause. In addition to these it is usually necessary to combat the liability to infection, so applications to eczematous areas consist of (1) a macerating drug such as sulphur or salicylic acid, (2) an antiseptic (if that is not also contained in the above), (3) a soothing or anesthetizing drug, and (4) an oily or protective ointment base. The possible variations, therefore, are innumerable, and physicians rarely hold to one formula for all patients. Patients suffering from eczema should be careful not to disseminate the disease, and nurses need to watch the disposal and storage of all the dressings and clothing of such patients.

Similar to eczema is the dry scaly eruption on the elbows and knees, and, when bad, also on the extensor surfaces of the limbs, called **psoriasis.** The nature and cause of this affection have not been accurately determined. Its treatment, however, with chrysarobin (chrysophanic acid) ointment is fairly successful when combined with general tonic treatment and hygiene.

Herpes is a term applied to small vesicles of nearly uni-

form size, occurring usually in groups. They may occur about the lips in pneumonia and similar diseases, and are then popularly known as "fever blisters." When grouped about the distribution area of some nerve they are called "herpes zoster" or "shingles." Thus in both cases they are due to an inflammation in or about the root of the nerve supplying that part of the skin. The local treatment is, therefore, simply to allay the itching and protect the vesicles from irritation while they are drying.

Acne is the disease caused by blocking of the sebaceous glands. It is usually called "blackheads." A bacillus is found so frequently in the contents of the dilated gland that a belief in its causal relation seems justified. However, acne appears so uniformly at puberty that we must believe also that changes in the character of the secretions at that time have an influence. The treatment is, therefore, the softening of the gland secretions with soaps and oils, and nowadays also the vaccination of the patient with cultures made from the bacteria found in the pustules.

Boils are known technically as furuncles. When two or more furuncles become joined or confluent we have a carbuncle.[1] These pustules originate (like acne) in the glands of the skin. The abscesses (for they are really such) extend beneath the skin into the underlying tissue. The only treatment is the opening and draining of the boil. Great care is needed to prevent the spread of the infection, for some of the organisms are very virulent. Lysol, bichlorid of mercury, formalin, and similar vigorous disinfectants should be used on the dressings and in the solutions when treating furuncles, and the patients should be warned not to use other peoples' towels and handkerchiefs, etc. Usually the presence of a "crop of boils" points to a weakness on the part of the patient that de-

[1] Carbuncle is the term also applied especially in Europe to the local manifestation of anthrax. In America the causative organism is usually a staphylococcus; or in the more severe cases a streptococcus.

mands some vigorous tonic treatment. Boils are hastened to maturity by applying poultices, heat from an incandescent light, or a Bier's cup; that is, by inducing an active hyperemia.

Infection of the skin with *fungi* (or molds) and other vegetable parasites produce a variety of skin lesions, such as ringworm, favus, barber's itch (sycosis), alopecia (circumscribed baldness), blastomycosis, psorothricosis, tinea versicolor, etc. The molds, while not easily killed, are fairly easily removed. The local treatment consists in macerating the epidermis until the fungi are exposed and then removing them with vigorous washing with soap and water. The best antiseptics are sulphur and iodin. The internal treatment by means of the iodid seems to raise the body's resistance to the parasites, and thus seems worth while.

The most used ointment contains resorcin or sulphur, or both. A similar effect is often obtained by simpler remedies. The purpose, however, has to be the same, namely, to apply some substance that softens the skin and is destructive to the molds or organisms thus exposed to its action.

Infection of the skin with *lice* produces distressing itching and eruptions wherever the parasites burrow. Thus we find scabies, or the common itch; pediculosis, or clothing, hair, and body lice. The use of sulphur ointments, vigorous washing, and fresh clothing seem all that is necessary in the way of treatment.

Tuberculosis of the skin is called **lupus.** This is treated best by the *x*-ray and Finsen ultraviolet light. Leprosy is, of course, also a constitutional disease, and its treatment is yet only in the experimental stage. Pellagra is another constitutional disease with skin manifestations. Its treatment is chiefly dietary and tonic. The eruptions of the so-called exanthematic diseases have been sufficiently discussed under their respective headings.

Traumatic injuries of the skin, such as burns, bruises,

and cuts, should be mentioned in passing. Burns are of three degress: in the first, a blister or vesicle is raised; in the second, the skin is necrotic and falls off; in the third, the tissues are charred.

Our first duty when called to see a **burn** is to stop the patient's suffering by protecting the exposed tissues from the air. This may be done by immersing the parts in warm water—even the whole body may thus be swung in a hammock in a bath-tub. Or, if that be impracticable, we cover the burned area with sterile vaselin or olive oil and bandage tightly. The use of soda and flour will also do if the more efficient oils are not at hand. In general, however, we should put on as little as possible in order to avoid the necessity of cleansing it off and thus causing pain when the doctor comes to give more thorough examination and treatment.

CHAPTER XXX

DISEASES OF THE NERVOUS SYSTEM

It is difficult to secure exact data as to the number of deaths due to nervous diseases, first, because many nervous diseases are the result of general systemic disease such as syphilis; and second, because many of the disorders do not lead to death directly, but simply incapacitate their victims for efficient service and make them more liable to other and acute disorders. The following figures, therefore, should be interpreted as minimal and not as actual measures of the prevalence of such disorders. In 1923 we find recorded 3652 deaths from meningitis, a rate of 3.8 per 100,000. Locomotor ataxia (tabes dorsalis) is credited with 1695 deaths, a rate of 1.7. Cerebral hemorrhage (apoplexy) had 86,854 deaths to its credit, a rate of 89.6. Only 3088 deaths were reported as due to epilepsy, a rate of 3.2. These figures should be compared with the total rate of 128.9 per 100,000 for all the diseases of the nervous system and of the organs of special sense (such as eyes and ears) together—a very impressive figure.

For our purposes we may class the diseases of the nervous system into two groups: the organic and the functional. The former include such disorders as paralysis, convulsions, etc., that is, conditions in which demonstrable changes in the tissues can be found. The latter consist of such disorders as neurasthenia, hysteria, and diseases to which we give the general name of neurosis.

Organic Diseases

Apoplexy signifies a "stroke" and has come to mean a stroke of paralysis, although there have been times in the

history of medicine when apoplexy could have meant a stroke or sudden attack anywhere in the body. The causes of a stroke of paralysis are cerebral hemorrhage, embolism, and thrombosis. Cerebral hemorrhage of course means that a blood-vessel has bursted in the brain and that the surrounding tissues have been flooded with blood and their functions thus destroyed. Embolism means that some small capillary or blood-vessel in the brain has been obstructed by a clot from somewhere else in the body, as in the case of heart disease. Thrombosis means that such a blood-vessel in the brain has become obstructed by a clot formed at that point. Still another cause of apoplexy is a lack of blood (ischemia) to a part of the brain. This is usually due to low blood-pressure or to a constriction or spasm of the blood-vessels. The result of any one of these causes is a softening and disintegration of the brain tissues so that they do not function properly. The result, as far as the body is concerned, depends upon what part of the brain was affected. It is undoubtedly true that many hemorrhages occur in the brain that we know nothing of because they occur in silent areas. But the most frequently known type of hemorrhage and, therefore, of apoplexy occurs in the internal capsule—that place where the nerve trunks from the spinal cord run out to the cortex. The internal capsule contains the fibers supplying the muscles to legs, arms, face, and mouth, etc., so that any hemorrhage occurring within its area causes a paralysis of some or all of these parts of the body.

When the paralysis affects all of one side of the body we speak of a hemiplegia. We call it hemiplegia even when the paralysis affects only the body and not the face. But the face may also be affected, and then it is a paralysis of the muscles of the opposite side to those of the arms or legs. When the lower half of the body is paralyzed we speak of a paraplegia.

These paralyses should not be confounded with the

facial paralyses that occur following colds and chilling of the nerve trunks round about the face, *e. g.*, Bell's palsy. For these facial paralyses are usually transient and full recovery results in a few weeks.

Paralysis may be either flaccid or spastic. The flaccid paralysis is the type in which the muscles are relaxed and cannot be contracted, so that the leg or arm simply swings loose by itself. In the spastic type, on the other hand, the muscles are drawn up and the legs or arms or fingers cannot be extended.

The type of paralysis depends upon the location of the injury. It it occurs in the highest neuron, that is, in the brain itself, we have usually the flaccid types. If it occurs further down, in one of the intermediate neurons, we have the spastic type with its contractures.

The outlook for paralysis depends upon the rapidity with which the blood-clot is absorbed and the tissues regain their tone. For if the nerve-cells are without proper nourishment for a long time they die. It is only, therefore, in cases of short duration that one can expect a full restitution of the function of the part of the body supplied by these nerve centers. On the other hand, a great many patients suffering apoplexy die at once or within a few days. Thus, there is an average death-rate of 68.1 per 100,000 exposed in the life insurance statistics. That is, 5.8 per cent. of all the deaths of this particular insurance company were due to cerebral hemorrhage and apoplexy.

Death statistics in this disease begin in the age period from twenty-five to thirty-four, where the rate per 100,000 is 8.9. The rate jumps rapidly to 35.9 in the next decade, while the maximum rate, 1841.5, is reached in the age of seventy-five. In other words, cerebral hemorrhage and apoplexy begin to operate as a cause of death in the end of the second decade and the rate increases until the very last years of human existence.

Thus it is interesting to note that beyond the age

sixty-five apoplexy and cerebral hemorrhage cause more than one death in every eight.

The cause of death may be either the paralysis of the respiratory and circulatory organs, or it may be a penumonia due to the inability of the patient to move himself and to keep the lungs from aspirating the organisms present in the nose and throat. For this reason it is wise to prop up the patient and keep him from lying too flat when he has been struck down by apoplexy.

Besides the effect on the arms and legs and muscles of the face, paralysis may affect also other nerve centers. For example, aphasia is the inability to use language. Thus motor aphasia is inability to speak, and alexia or reading aphasia is inability to understand the letters seen on the printed page, and sensory aphasia is inability to understand words spoken. When aphasia occurs the blood-clot is usually on the left side of the head well to the front.

Attacks usually come on without warning, sometimes in the sleep. Usually the loss of consciousness is sudden and complete, but occasionally it comes on gradually. The patient lies apparently asleep, with slow and blowing respiration. The cheeks and mouth usually blow out with each expiration. There may be one or two convulsions. The eyeballs may be turned to the side on which the clot occurs. In a few hours a fever is apt to begin, and this sometimes denotes the beginning of a pneumonia. Because most cerebral hemorrhages occur in the one artery supplying the internal capsule and the motor area (this artery is called the artery of cerebral hemorrhage) the results usually are so uniform that we think of paralyses only of motor areas. But other areas of the brain are often affected, and sensory disturbances do occur.

It is very difficult to make a diagnosis when one finds an unconscious patient on the street. For example, this same type of coma could be due to uremia from kidney disease, or to diabetes, or even to intoxication. Con-

sequently, ambulance doctors are to be forgiven when they accuse people thus found unconscious on the street, but who are really seriously ill, of being plain "drunks."

In cases of high blood-pressure prompt bleeding of the patient is good therapy. Otherwise one applies cold to the head and heat to the feet. And the bowels are cleansed as soon as it can be done. Massage of the paralyzed areas is indicated, so also the use of electric treatment, after the lapse of a week or two. The purpose of this treatment is to prevent the degeneration of the muscles involved.

Myelitis is an inflammation of the spinal cord, due either to an injury (such as a blow or a fall) or to infection (as from the bacillus influenzæ). This, of course, produces a partial paralysis, in that the nerve-fibers within the area of inflammation become inactive and loss of sensation and motion in the parts supplied by these nerves result. In this disease, unfortunately, connective tissue seems to replace the nerve tissue destroyed by the inflammation, so that it is not a matter of regaining one's original strength after the inflammation subsides, for if the nerve paths ever regenerate at all, it is not to their original fulness. Hence, degeneration of the muscles supplied by the affected nerves is apt to result. Infants seem specially susceptible to this form of inflammation, and carry its marks with them through life in the form of dragging feet or weakened arms.

Shingles is an infection of the nerve ganglia along the sides of the spinal cord just where the nerves leave the spinal cord, that is, upon the sensory side of each spinal nerve. When these ganglia become inflamed, there is pain felt in the portions of the skin served by these nerve trunks. Such inflammations are accompanied by a slight fever, but pain is the chief symptom. In a few days there develops along the area supplied by the nerve a crop of blisters (herpes zoster) which are more red than ordinary water blisters, and look very much like cold sores on the lip. These sores cause a considerable itching and

have to be treated by ointments or powders. For the pain itself nothing except the opiates or the coal-tar analgesics seems to be worth while.

The cause lies probably in the infection entering the body through the tonsils or the respiratory tract.

When an inflammation attacks several nerve trunks at once we have what is called **multiple neuritis.** There are several diseases of this type; for example, beriberi is really a multiple neuritis. So also there is a multiple neuritis from the long-continued use of alcohol. There is tingling in the nerves of the skin, especially in the fingers and toes, and partial loss of sensation in the skin, and some loss of power in the muscles affected. Familiar examples of this disease are found in wrist-drop and in foot-drop where the patient cannot use either the hand or the foot unless very awkwardly. Thus if we see a patient going along the street and walking as if he were stepping over a 6-inch-high plank, we suspect that he may have a multiple neuritis that compels him to take this steppage gait.

The disease may be due to infection, but it may also follow the use of alcohol, and we have an alcoholic neuritis with its peculiar psychosis or mental condition, characterized by loss of orientation in both time and space. We have also a multiple neuritis following some cases of diphtheria and typhoid.

The treatment, of course, calls for long-continued rest and the use of heat, massage, electricity, accompanied by tonic medicine. Open-air treatment in a favorable climate, of course, offers the same result to those able to secure it.

Disseminated or **multiple sclerosis** is a myelitis affecting patches of nerve tissue here and there in the cord and brain producing changes in speech, unexpected stumbling, and other transient irregularities of nerve action. The standard symptoms are:

(1) Intention tremor,
(2) Scanning speech,
(3) Nystagmus.

Thus, when the patient reaches out for an object his hand trembles violently. He talks in a slow, indistinct, monotonous tone, and his eyeballs have a jerky motion as they move from side to side. This disease is progressive and ends in death in from two to twenty years.

Tabes dorsalis is also called locomotor ataxia because of the inability of its victims to walk naturally. It is a degeneration of some of the nerve-paths (bundles of Goll and Burdach in the posterior horns) in the spinal cord. Its symptoms are:

(1) Loss of reflexes in the knee (patellar).
(2) Rigid pupils (Argyll-Robertson pupils).
(3) Loss of poise with eyes shut (Romberg's sign).
(4) Lightning pains (in legs or girdle or kidney).
(5) Atactic gait (the foot is lifted high and the heel strikes first).

The disease lasts for years, and while it rarely kills outright, so weakens the patient that he is apt to die from pneumonia or other acute infection. The best treatment is the training of new nerve-paths to take the place of the degenerated ones. This, of course, takes months of effort under the most competent direction. The cause of tabes dorsalis is syphilis, usually acquired some ten or fifteen years before the outbreak of the nerve trouble. The treatment of the causative disease by arsenic and mercury seems to have a beneficial effect on the tabes.

One learns to suspect the presence of locomotor ataxia in cases of gastric crises; that is, an upset of the stomach and bowels with severe pain lasting for a short time and stopping as suddenly as it began. Such crises, however, sometimes may last for two or three days. These attacks make one think of colic or, again, of gastric ulcer. One also thinks of locomotor ataxia when one sees a man walking along the street and stepping high; and again, when one sees men whose pupils are constantly contracted down to pin-points.

Meningitis is an inflammation of the coverings or capsules of the brain. If the outer covering, or dura mater, alone be attacked the disease is called pachymeningitis; if the inner coat, or pia mater, be the seat of the trouble, it is leptomeningitis. Usually, however, severe forms attack both layers. We find several forms of meningitis, when classified as to causation, for example, epidemic cerebrospinal meningitis, syphilitic meningitis, alcoholic meningitis, tuberculous meningitis, secondary or septic meningitis. (This last form follows pneumonia, diphtheria, otitis media, and other acute infectious diseases.) The differential diagnosis need not concern us here. The mortality varies in the different types—from tuberculous meningitis, which is practically always fatal, to syphilitic meningitis, in which nearly all the cases treated right recover. The symptoms vary according to the part of the brain attacked by the disease. The general symptoms are headache of a boring character, backache, projectile vomiting, painful cervical and dorsal rigidity, hyperesthesia, etc. Moderate fever is usually present in the acute forms. Severe cases are marked by delirium and coma. The most frequent form of meningitis during recent years has been the cerebrospinal fever which is discussed elsewhere. This caused 823 deaths out of a total 4171 among the policy holders of the Metropolitan Life Insurance Company.

Deaths from meningitis were distributed by age in this insurance report as follows:

Years.	Rate.
1– 4	7.2
5– 9	2.6
10–14	1.8
15–19	1.7
20–24	1.1
25–34	.8
35–44	.7
45–54	.8
55–64	.3
65–74	.4

The disease, therefore, is to be watched for in infants and children; and it is a suspicious symptom when the child suffering from fever, who might not be able to explain his symptoms in words, bores his head backward into the pillow. Quite often there is a piercing, inarticulate cry characteristic of the disease. There is generally also an inability to flex the thigh on the abdomen (Kernig's sign), or if one raises the child's head—*i. e.*, bends the neck forward—the child will involuntarily flex its knees and hips (Brudzinski test). Another means of ascertaining the character of the disorder is the lumbar puncture: A hollow needle is inserted between the second and third or the third and fourth lumbar vertebræ, and the fluid thus obtained is examined. While making this puncture it should be noted whether the pressure is small or great and whether the fluid is clear or cloudy as it comes out. The nurse should have the patient on his side with the back bent to give the maximum dorsal curve, and the whole space between the last dorsal vertebra and the sacrum sterilized ready for the operation.

Of course, in meningitis the tongue is coated, the bowels constipated, and the general signs of a disorganization of the body functions present. Some forms of meningitis may last for months, but generally the fate of the patient is settled in a few days. The particular treatment needed is absolute quiet, with the ice-bag at the head. The drug treatment varies, of course, with the cause.

Paralysis agitans, also called shaking palsy, and again Parkinson's disease, is a paralysis characterized by a tremor, rhythmic, running about eight to the second, followed by muscular rigidity with a consequent weakness. It is a disease of middle and advanced age and seems to be due to an infection of one of the nuclei of the brain. The disease is rarely fatal, but drags on year after year with a gradual increase in the amount of muscle involved in the tremor. Thus, the tremor may begin in the right hand

and then after some months extend to the right foot, and then, still after some months, extend to the left hand, and so on. The face assumes a mask-like expression, or lack of expression, and the body is apt to be bent forward in order to make the movement easier. The patient walks as if shot out of a gun, or pushed forward rapidly in one direction, and finds it rather difficult to turn quickly. The voice is low and rather monotonous in expression.

But, strange as it may seem, the mentality of the patient is not affected, nor is his ability to use his hands or feet, but the constant tremor tires his muscles out, so that he complains of weakness or fatigue. And he is really weakened by this constant exertion. He is at rest only when he is asleep or at least very much relaxed. Any excitement makes the tremor worse, but if he goes to extend his hand to do something definite the tremor disappears. This distinguishes it from the intention tremor of disseminated sclerosis.

Treatment.—The treatment of paralysis agitans is practically symptomatic. The patients are kept out-of-doors and as active as possible. Hypnotics may have to be given. The bladder and bowel weakness requires constant watching. As far as an attack on the disease itself is concerned the most widely used drug is hyoscine. But the results of drug treatment are so meager that the general opinion is that the most effective treatment is tactful supervision of the life and habits of the patients.

Parkinson's disease should be differentiated from Parkinson's syndrome, a condition which seems to follow influenza. The signs of the syndrome are mask-like face, monotonous voice, emotional depression, and sometimes tremor of jaw or extremities. The syndrome is an accompaniment of encephalitis lethargica in some of its stages, while Parkinson's disease seems to be a disease entity.

Hydrocephalus is usually congenital. It is essentially

the accumulation of fluid in the ventricles of the brain ("water on the brain"), with the consequent distention of the brain and skull. Its cause is, in a large percentage of the cases, tuberculosis; it may also, apparently, be due to trauma. Its results are always bad, because if the child survives at all it is usually weakminded, even if the body be not dwarfed and undeveloped. The skull reaches enormous dimensions, the fontanels are open, and the hair thin. The treatment by puncture is usually unsatisfactory. Bandaging the head is also unsatisfactory.

The best general treatment is to apply ice to the skull and so support the head that it cannot be jarred or moved violently. The bowels and bladder must be emptied without disturbing the child. Hot baths are given to stimulate the circulation in the rest of the body. Sometimes the alternation of heat and cold is necessary to keep the respiration going.

Hydrocephalus is more properly a disorder of infancy. There is, however, once in a while a case of adult hydrocephalus not secondary to brain tumor. It is almost impossible to make a diagnosis from the symptoms, which are headache, recurring attacks of coma, optic neuritis, etc., because they occur in other cranial disorders also. The sutures of the skull may not be at all separated. The diagnosis is therefore now made by taking skiagrams of the skull after injecting the ventricles of the brain with some opaque substance.

Epilepsy is a disease characterized by paroxysmal loss of consciousness, or fainting attacks. We must not think that all epileptics have convulsions, because some swoon away and are very quiet. Sometimes the word "fit" is used to characterize epilepsy. If, then, we mean under the term "fit" a loss of consciousness, then epilepsy is characterized by fits, but if we mean by "fits" convulsions, we cannot use that word in our definition.

What causes this disease is as yet unknown. But we have an idea that some localized disease in the brain itself

is usually responsible for these attacks. Thus, a tubercle in the cortex of the brain might give rise to these explosions that we call "epileptic fits" or seizures. So also the scar from an old injury. And we believe by analogy that other infectious processes may leave their results in different parts of the brain. Some reflex activities may produce trouble in the brain and cause such explosions. For example, intestinal indigestion has been shown by some writers to cause an absorption of poisons from the bowel that may produce epileptiform attacks.

When the patient becomes completely unconscious, and this unconsciousness lasts for some minutes, we call it epilepsy of the "grand mal" type. It is usually accompanied by a frothing of the mouth or a biting of the tongue and involuntary urination and defecation.

If, on the other hand, the patient simply be stopped for an instant from whatever he was doing, if he happens to be talking and stops for an instant and loses himself, and then goes on without noticing, or there is just the faintest sign of unconsciousness, we call it epilepsy of the "petit mal" type.

The attacks usually come on, at first, in the night, and after the disease gets worse during the day also. The attacks may come on separately or there may be a succession of attacks producing the epileptic state (or status epilepticus).

When the disease begins early in youth the outlook is not as good, of course, as it is when it begins later in life because it shows whatever caused the disease is deeply ingrained in the system of the individual. Epilepsy rarely ever leads directly to death, but the deterioration of the mental life of the patient unfits him for society; and the condition may lead up to other diseases. For example, the memory is badly affected as well as the higher centers. The patient may become morose and ill-tempered, hard to get on with. With some it develops

a real insanity and mania may become so violent as to require confinement in an institution.

Jacksonian epilepsy is a form in which there is a localizing symptom as shown by the preliminary sensation (or aura) leading up to the attack. Thus, the twitching of a muscle, as in the face, or of the finger, will lead us to locate the point in the brain where the irritation is at work. Then, if we care to, it is possible to cut down through the skull and try and remove the scar tissue or other diseased tissue that is causing the irritation.

The *treatment* of epilepsy calls for the building up of the entire body by an open-air life with as little mental and nervous work as possible. Therefore, institutions located in the country are best adapted for caring for these unfortunates. The use of drugs simply depresses the nervous system and decreases the number and violence of the attacks. Thus the bromids are usually given and lately luminal or phenobarbital is being added to the bromids for its depressant effect. These drugs are the essential part of the advertised "cures for fits" and epilepsy.

During an attack the patient should be stretched out flat on the floor if a bed is not handy, better, of course, in the fresh air, and his chest freed from constricting clothing. It is not necessary to hurry up his return to consciousness by the administration of stimulants. Usually the return comes back in the same time after each attack no matter whether stimulants are used or not.

It is the general belief that most cases of epilepsy occur in individuals who by family inheritance or by other congenital defects have a weakened nervous system. Such patients naturally are more liable to react sharply to the nervous irritation from such things as intestinal upsets, or the hooded clitoris, or the long adherent prepuce, or the tight anal sphincter, or the many other conditions spoken of as causing epilepsy. The "moral" of such a belief is that individuals suffering from epilepsy should

not be allowed to bear children, and again, that such disorders as those mentioned should be cared for in early childhood.

Migraine is in many ways a reminder of epilepsy. It is a regularly recurring one-sided headache, of such intensity that the patient must lie absolutely quiet in a darkened room for two or three days and have anodynes administered. Possibly it is due to an insufficiency of the liver, in that this gland does not break down into simpler products, ready for excretion through the kidneys, all the poisonous waste products gathered up from the various parts of the body by the blood-current. When these products accumulate in sufficient quantities to poison the nerve-centers and interrupt the smooth running of the body machinery, an attack of migraine results. The vomiting, the sweating, and the purging incident to the attack cleanse the body of these offensive matters, and life goes on once more until a new accumulation induces another attack. In children the regular recurrence of seasons of vomiting (cyclic vomiting) is an equivalent for what may become migraine in later life.

The treatment of either cyclic vomiting or migraine is, of course, the stimulation of the liver and the keeping the intestinal tract free and clean, coupled with free exercise out of doors. Such patients should not be allowed to do much confining mental work. During an attack of migraine the bowels should be fully purged by mineral waters and by enemata. The stomach should not be burdened with food. Sweating (including the drinking of considerable water) will help to shorten the attack.

Neuritis is an inflammation of one or more nerve trunks. This causes the nerve to be tender when pressed upon and gives rise to a pain or an ache sometimes steady and sometimes lancinating and shooting in type. One nerve alone may be affected or several nerves may be simultaneously affected. When the nerve ganglia or centers in the spinal cord are affected we have symptoms not

only of the type mentioned with sensations ascribed to the area supplied by the nerves, but also a degeneration of the tissues supplied by the nerves. Thus, we have the progressive muscular atrophy of childhood, and similar degenerations in different parts of the body in patients of all ages due to the fact that the nerves supplying them have been injured either in the nerve trunk itself or in its center by such infections.

Thus, Bell's palsy, for example, is due to an exposure to cold or a chilling of the nerves of the face. In this disease the patient suddenly finds that he cannot close one eye, or cannot control one side of his mouth, or cannot whistle. The prognosis is good, for in a few days or weeks the paralysis will disappear as suddenly as it came.

Since **neuritis** is an inflammation of the nerve or its sheath, pressure over the course of the nerve gives rise to pain. The inflammation may originate in the ganglion or root of the nerve, or may be due to a pinching of the nerve trunk by nearby bones. Neuritis attacks most frequently the nerves of the thigh (sciatic) and shoulder (brachial plexus). It is attended by great pain on movement, and on changes in the environment from heat to cold. Sometimes the pain is not continuous, but instead a regularly recurring spasm. This type is called "tic douloureux," and is found most commonly in the course of one of the branches of the trigeminal nerve in the face. There is a tendency toward degeneration of the nerve-fibers involved, but most cases recover and almost no deaths occur from the neuritis itself. The cause is a toxic one. Thus, chronic lead-poisoning shows itself in a neuritis; so does chronic alcoholism. Probably many cases are due to toxins absorbed from the intestinal tract in cases of constipation and intestinal infection. The treatment is tedious and consists of rest in bed, hot baths (dry air), etc. No massage or electricity should be used at the beginning. Later, however, they will shorten convalescence.

Neuralgia is sometimes relieved by pressure, while

neuritis is made worse by pressure. Neuralgia usually attacks the fifth cranial and the intercostal nerves, instead of those of the extremities. It is usually caused by reflex irritation, as from abscesses of the teeth, infected sinuses, etc. When the causes are removed the patient rapidly recovers. Rest and heat are the sovereign remedies.

Sciatica is an inflammation of the sciatic (ischiadic) nerve running down the back of the leg. It is, therefore, a neuritis. The pain is made worse by bending on the hips or straightening the legs—any motion that stretches the nerve trunk.

The cause usually lies in an inflammation in the neighborhood of the origin of the nerve in the spinal canal. Thus, we find many cases of sciatica due to vesiculitis in the male and to inflammation in the pelvix in the female. So also bony spurs on the vertebræ may produce these symptoms. Of course, infections localizing in these tissues may cause the symptoms of sciatica. These causes should be sought for and relieved. When they cannot be found, then the systemic treatment of rest, heat, and the injection of alcohol or other substances in the nerve trunk may be tried.

Beriberi is a multiple neuritis in which the legs become weak and less sensitive. The trouble may reach the arms, head, and trunk. The affected area is edematous. The power of sensation is not only lessened but also changed, so that pains, itchings, crawlings, etc., are felt. The heart and vital organs are affected so that there is heart palpitation and shortness of breath. In case the heart is severely attacked the disease may prove fatal within twenty-four hours. Usually, however, the disease extends over weeks and months, and is especially prevalent in warm weather.

Beriberi, or kakke, is found endemic in China, the Malay Archipelago, Japan, and the Philippines. It is present also in South America and the West Indies. The fishermen on the Newfoundland Banks are often attacked, as are also the Chinese and Japanese in California. This

disease has also appeared in Louisiana and Arkansas (in state hospitals where the patients were too crowded to be well fed and cared for).

The mortality varies from 2 to 50 per cent.

In the Philippines it has been found that people fed on unpolished rice do not take the disease. This leads us to believe that the disease is due to improper diet—for example, to the lack of phosphates or vitamins. It is classed, therefore, among the deficiency diseases.

The *treatment* is primarily one of nourishment. The diet should be mixed and as plentiful as the patient can take. Acetylsalicylate is sufficient for the pains. Bed rest, massage, and good nursing complete the list of essentials.

St. Vitus' dance, or **chorea,** has for its chief symptom an involuntary inco-ordinate jerky movement of some group of muscles. Thus, it may be the shoulders, which shrug constantly. It may be the chin and neck muscles that keep in action. Sometimes it is only an irregular, asymmetric contraction of the muscles of the lip or eyelid. The disease attacks more often females between five and fifteen years, and is probably due to a streptococcic infection of the nerve-centers. Therefore, it accompanies other streptococcic infections, such as rheumatism, scarlet fever, etc. Naturally, it appears most often where patients suffering from some such disease are exposed to nervous excitement, shock, etc. The face is most commonly involved. The speech suffers in 25 per cent. of the cases. The mind suffers in only the most severe cases. The length of the attack is usually from two to three months. In about half the cases the disease recurs. No deaths result from the disease itself, but may result from the underlying weakness.

This disease, called also Sydenham's chorea, must be differentiated from **Huntington's chorea,** which is hereditary and comes on adults in their thirties and leads to dementia. It must also be differentiated from habit spasm and other nervous "tics."

A rarer disease, with which chorea may be confused, is **Friedreich's ataxia.** In the latter disease, however, the eyeballs move jerkily (nystagmus), the speech is monotonous ("scanning"), the spine is apt to be deformed (*e. g.*, scoliosis), and the muscular movements are slow. Hysteria may also be confused with chorea. In fact, the differential diagnosis may require much time and study. One can only say that in general the hysteric movements are apt to be symmetric (that is, alike on both sides of the body) and more rhythmic.

The *treatment* of chorea calls first for combating the infection with the salicylates. Then the body should be "toned up" with iron, arsenic, fresh air, rest, and sunshine. During the height of the attack, of course, the patient must be kept quiet in a darkened room, with ice-bags to the head, and the other adjuvants for the treatment of nervous disease. During convalescence one tries to send the patients to the seashore or the mountains.

Vasomotor upsets produce a curious group of diseases. Thus we have **angioneurotic edema** in which there is a transient swelling of the face or the extremities. At different times, at different places, this swelling or edema may come on suddenly. It may be due to an upset anywhere in the body, or even to general nervousness. But usually the cause is an allergy or sensitization to some foodstuff, or pollen, or bacterium. For temporary relief adrenalin chlorid solution is injected under the skin. But for a cure the cause must be searched out and removed or neutralized.

Erythromelalgia shows pain, reddening, and warming of the hands and feet, occurring at different times in the day, and made worse by the congestion due to permitting the hands and feet to be lower than the rest of the body.

Then there is **Raynaud's disease,** where we have a numbness in the extremities, particularly where the numbness reaches such an extent that the skin is white and the parts are cold. Chilblain is a popular example of this disease. If the spasm controlling the circulation

persists, of course, a degeneration may set in and the parts become gangrenous and slough off. In such conditions one expects both sides of the body to be affected alike. Thus, if the great toe on one side is affected, the other toe is affected also. This enables us to distinguish this disorder from purely local affections.

Functional Nervous Disorders

When we discuss functional nervous disorders we find ourselves dealing with one of the most unsatisfactory phases of modern medicine. Here the mental and physical are so thoroughly interwoven that it is almost impossible to discern whether we are dealing with symptoms resulting from mental worry and anxiety or from physical disorders. These conditions are the more common in modern American life because the whole atmosphere is leading us to look upon ease and pleasure as the inalienable rights of every human being. Since it is inconceivable that such a condition as complete success and satisfaction can exist for every one as long as the ideals of men and women are essentially selfish and self-seeking, we must expect every one of us to meet failures and disappointments. In other words, a large amount of nervousness is engendered by the striving for the impossible. Observation leads one to believe that a great deal of the present prevalence of nervous troubles would disappear if our people would only get back into the frame of mind of our Puritan ancestors, and look upon this life as a workshop rather than as a pleasure garden, and seek to do the most good possible rather than to receive the greatest amount of pleasure.

The symptoms of general nervousness and of functional nervous diseases in general are usually headache and backache, aside from irritability of temper and other mental symptoms. Thus, neurasthenia, or nervous exhaustion, carries with it not only these symptoms but also a dislike for exertion either physical or mental. The

digestion is, of course, deranged, the appetite capricious, and the bowels sluggish. Pains are apt to appear anywhere and everywhere in the body, and all sorts of diseases will be simulated.

In general, one might say that neuroses cause an exaggerated response to ordinary stimuli. Thus pain is felt more keenly, and ordinary upsets of every-day life become tragedies in the day of the neurotic. The result is that what would be merely disagreeable sensations to a well-balanced individual become exquisitely painful to the neurotic individual.

Neurasthenia is characterized by a lack of zest for exertion, by headaches and backaches, by morning fatigue, and evening liveliness. Work, especially of the mind, causes a headache. These headaches may be simply a sense of pressure on the top of the head, or an ache from the shoulders to the occiput. There is usually a lack of appetite and a relaxed condition of all the body forces. The cause may be too long application along one line—as the nerve exhaustion of a minister from preaching, which causes him to suffer intensely from headache after such an exertion. Or it may be due to monotony, as in the case of a woman who has no interest outside herself and lives a dreary round of similar activities day after day. Or the cause may be due to a constitutional disease such as typhoid fever, or a severe surgical operation.

Neurasthenia is, therefore, essentially an exhaustion, usually an exhaustion of the nervous system, but in many cases there is a basic exhaustion of the whole body. Consequently, any scheme for the improvement of this condition requires that rest be obtained. The type of rest must be arranged to fit our diagnosis of the underlying condition. The prophylaxis of the condition, therefore, requires that people with subnormal constitutions should not be spurred on to their utmost and exhausted early in life, as is the tendency under modern conditions. In fact, prophylaxis would indicate that it is necessary for

us to conserve more sharply the strength of our young people when we discover that they are being pushed too fast in school or in other nervous exertions, such as the social whirl. It is wise to restrain their activities and to teach them if possible to keep within their limits. Each twenty-four hours should be regarded as a unit, and they should not expend more energy in that twenty-four hours than they secure from their food and other sources of income. As long as they awake in the morning tired and worn-out they are not keeping within their incomes and are liable to neurasthenic attacks.

Neurasthenia is used by the laity to cover too many different types of nervousness. The term **hysteria** would better fit the condition of many so-called neurasthenics. The former refers properly to the nervous exhaustion described in a preceding paragraph. Hysteria is, however, applied to an overexcitability of the nervous system, a condition where emotionalism is apt to run riot, and all sorts of peculiar conditions obtained as a result of mistaken notions becoming fixed in the mind. Thus, hysteric paralysis is common. Hysteric aphonia, or loss of voice, is another rather frequent manifestation. Hysteric dyspepsia, hysteric hypersensitiveness, or its opposite, hysteric anesthesia, are also some of these disorders which make the life of the conscientious physician unhappy. Hysteria may lead to mob violence, on the one hand, or to religious enthusiasm on the other.

Neurasthenia may frequently be cured by simple rest; but hysteria is only once in a while really cured. It is, however, only seldom that a neurasthenic has sense enough left to drop out of life and remain practically dormant for the many months necessary for a cure. These two classes of patients, therefore, form the support for the quacks and the wonder workers of every city. The hysterics do not realize, of course, in what their sickness consists, and will not, therefore, subject themselves to a prosaic course of treatment.

In the severer cases of hysteria we sometimes find

"double personality." And since this symptom stimulates popular interest and is spread at length in the press the following case, published originally by Weir Mitchell, is cited to illustrate the condition:

"Mary Reynolds was an intelligent calm child, rather reserved and melancholic, but of apparent good health. The nervous disturbances began toward the age of eighteen with a rather protracted fainting spell, after which she remained for five or six weeks blind and deaf. The sense of hearing returned all at once; the sense of sight returned gradually and completely. After a second syncope, which lasted from eight to twenty hours, she awoke apparently with all her senses, but she had forgotten all her former life and all the knowledge previously acquired. Nothing was left her but the power of instinctively pronouncing, like a child, a few words without understanding them. She was obliged to learn everything anew, but it must be acknowledged that her education was rapid, since after a few weeks she could again speak, read, and write. It was noticed that she learned again to write in an odd manner. She handled her pen awkwardly and began to copy from the right to the left after the manner of the Orientals. She always kept in this second existence an inverted handwriting very different from her ordinary handwriting. In this second existence her character was quite transformed. She had become lively, cheerful, was no longer afraid of anything, wandered about the woods, played with dangerous animals. She dealt shrewdly with and mocked every person who wanted to direct her, and, in reality, no longer obeyed anybody. After about ten weeks she again had one of these strange sleeps and awoke of herself in the first state. She no longer had any remembrance of the period which had just elapsed, but she recovered her previous knowledge and character. She was slower and more melancholic than ever. After some time the same accident caused her to return to the state which appeared to be the second. These transitions often took place in the night during her natural sleep and some-

times in the daytime, and they were often painful. The subject was, as it were, frightened by a kind of feeling of death, "as if I were never to return into this world." When the second existence reappeared Mary Reynolds was again exactly in the state she had been in at the end of corresponding period with the same acquired knowledge and the same remembrances; but she again forgot everything when she returned to the state No. 1. About the age of thirty-five or thirty-six the State No. 2 became definitely predominant. It was reproduced more often, lasted longer, and at length became in a manner definitive, since she remained twenty-five years in this state. At the end of her life there seemed to be a kind of confusion between the two states, at least the state No. 2, which had become preponderant, expanded and seemed vaguely to acquire remembrances belonging to the state No. 1. "It seemed to me that I had had, as it were, an obscure dream-like idea of a shadowy past which I could not quite grasp."

Treatment.—Re-education is the only successful method of treating functional disorders. This consists in getting the patient away from his former environment into a room by himself; and then, patiently, day after day and week after week, explaining and demonstrating his real condition. Where this plan of treatment has been carried out about one-half the patients have been practically cured and have been sent back into life as useful citizens.

We find in general that the nervous condition is best when the weight of the patient is nearest normal. Therefore, the feeding and exercising of hysteric and nervous patients must be carefully supervised, and the weight taken weekly.

The nursing in these functional disorders is most difficult if the nurse be anything more than a caretaker for the body. The demand is made on her for constant sympathy, almost supernatural forbearance, and with it all a firmness and positiveness that will influence the patient for good.

CHAPTER XXXI

MENTAL DISEASES

In order to show the complexity of the classification of mental diseases we give the following table from the statistical manual issued by the National Committee of Mental Hygiene for the use of hospital authorities when making out their reports:

1. Traumatic psychoses:
   (*a*) Traumatic delirium.
   (*b*) Traumatic constitution.
   (*c*) Posttraumatic mental enfeeblement (dementia).
2. Senile psychoses:
   (*a*) Simple deterioration.
   (*b*) Presbyophrenic type.
   (*c*) Delirious and confused types.
   (*d*) Depressed and agitated types.
   (*e*) Paranoid types.
   (*f*) Presenile type.
3. Psychoses with cerebral arteriosclerosis.
4. General paralysis.
5. Psychoses with cerebral syphilis.
6. Psychoses with Huntington's chorea.
7. Psychoses with brain tumor.
8. Psychoses with other brain or nervous diseases:
   (*a*) Cerebral embolism.
   (*b*) Paralysis agitans.
   (*c*) Meningitis, tuberculous or other forms.
   (*d*) Multiple sclerosis.
   (*e*) Tabes dorsalis.
   (*f*) Acute chorea.
9. Alcoholic psychoses:
   (*a*) Pathologic intoxication.
   (*b*) Delirium tremens.
   (*c*) Korsakow's psychosis.
   (*d*) Acute hallucinosis.

(*e*) Chronic hallucinosis.
(*f*) Acute paranoid type.
(*g*) Chronic paranoid type.
(*h*) Alcoholic deterioration.

10. Psychoses due to drugs and other exogenous toxins:
    (*a*) Opium (and derivatives), cocain, bromids, chloral, etc., alone or combined.
    (*b*) Metals, as lead, arsenic, etc.
    (*c*) Gases.
    (*d*) Other exogenous toxins.
11. Psychoses with pellagra.
12. Psychoses with other somatic diseases:
    (*a*) Delirium with infectious diseases.
    (*b*) Postinfectious psychosis.
    (*c*) Exhaustion delirium.
    (*d*) Delirium of unknown origin.
    (*e*) Cardiorenal diseases.
    (*f*) Diseases of the ductless glands.
13. Manic-depressive psychoses:
    (*a*) Manic type.
    (*b*) Depressive type.
    (*c*) Stuporous type.
    (*d*) Mixed type.
    (*e*) Circular type.
14. Involution melancholia.
15. Dementia præcox:
    (*a*) Paranoid type.
    (*b*) Catatonic type.
    (*c*) Hebephrenic type.
    (*d*) Simple type.
16. Paranoia or paranoid conditions.
17. Epileptic psychoses:
    (*a*) Epileptic deterioration.
    (*b*) Epileptic clouded states.
18. Psychoneuroses and neuroses:
    (*a*) Hysteric type.
    (*b*) Psychasthenic type.
    (*c*) Neurasthenic type.
    (*d*) Anxiety neuroses.
19. Psychoses with psychopathic personality.
20. Psychoses with mental deficiency.

A few brief definitions of these terms will be helpful:

"Psychosis" seems to be used to cover any abnormal mental state or condition, whether it be permanent or merely temporary.

"Delirium" is defined as a condition of extreme mental (and usually motor) excitement formed by a succession of "flight" of rapid and confused and unconnected ideas; often with illusions and hallucinations. Delirious patients are usually disoriented (*i. e.*, confused as to time and place).

"Dementia" is a mental disorder characterized by more or less complete loss of mental facilities; memory seems the most liable to fail.

"Mania" is a mental state characterized by great psychomotor activities, a rapid passing of ideas, exaltation, and unstable attention. The patients may be oriented.

"Melancholia" may be either a mental disease marked by apathy and indifference as to one's surroundings, mental sluggishness and depression, or it may be simply a symptom occurring in other psychoses marked by depression of spirit and by painful and sluggish processes of thought.

When through reasoning or so-called reasoning a patient reaches wrong conclusions we say that he has a delusion. When, however, he hears voices when there are no voices to be heard, we say he has an illusion. And when he sees objects that are not really present we say that he has illusions, the illusions of sight.

In melancholia the patient considers himself as wretched and worthless and accuses himself of imaginary crimes and faults. He sits, then, in hourly dread of punishment. Again, the patient may believe himself without friends, money, or clothing. This is quite frequent in senile dementia. Or, again, the patient considers himself incurably diseased, the "spinal marrow is softened" or the "stomach is obstructed." Finally, nothing is what it appears to be.

The sun is not shining, the bones are soft, etc. In general, the melancholic delirium is monotonous, repeating time after time the same thoughts. It is passive and humble. The delusions refer to the past or the future—rarely to the present. Melancholic delirium is apt to lead to the refusal of food and to suicide.

An example of the flight of ideas given by Dr. Rosanoff is the following: "Now, I want to be a nice, accommodating patient; anything from sewing on a button, mending a net, or scrubbing a floor, or making a bed! (Laughs, notices nurse.) But, I don't like women to wait on me when I am in bed; I am modest; this all goes, because I want to get married again. Oh, I am quite a talker; I work for a New York talking machine company. You are a physician, but I do not think you are much of a lawyer, are you? I demand that you send for a lawyer! I want him to take evidence. By God in Heaven, my Saviour, I will make somebody sweat! I worked by the sweat of my brow. (Notices money on table.) A quarter, twenty-five cents; In God we trust, United States of America, the Army and Navy forever!"

The following letter may also serve as an illustration of the confusion of thought in mental disorders:

"I am looking for some one to assist me with some invention Ideas all they that have money I know thinks a girl in the kitchen cant do the sont—All the same my mother and sisters life depends on my efforts in getting money. That the only hope—as mother on her feet works there having arisipilas I cant stand hard work my self since Dr. H chocked me that I know what dying means. How that makes me shiver to think off Also Miss W whipped me—Thinking off my poor mother & sis I get nerve to ask any one for assistance with Inventions That hospital wreck has most cost my life—I have forgiven them all and thankful Ive never done the like as its a pity they espire no higher I close in haste

(Signed) Miss E—— B——

will quit housework tomorrow so adress General Deliver City If you decide to assit
p. c. If they bring anything who pays for rights $45 who handles it with ought atterny.
Also the appreciation will be with me to last day off my life. I truely feel If there was such as real Justice R hospital damaged me at least $5,000 worth they all say sue them—Dr. R. failed to take right interest—caused me very much suffering and quit him—wrote you before thought adressing to R. Hospital perhaps you failed getting it.
When I was at R. S. hospital I was in a terrible state off health and to confess the truth I was more dead then alive when all off you thought I was unbalanced If you new the truth as I only know It was my strong nevulution that Saved me I was so awful broken hearted—because my life before was always gloomy my parants always moning over sircumstances and sisters case this much to say she as my self needs a chance to rest & have a real vacation which we never had off course she had rested there but worry over patants being miss treated about her she telling me—If I got her ought shed live If not the reverse—So Ive craved just this much sympathy in telling my trouble that some one who had a soul would be touched and assist me all refused to help I consider them no friend at all after a prayer that God would show me a way—The Ideas came one after another Good they say Even some are ought all ready.
I was awful angry off course there in H. But my so unreasonable to all to treat me so mean—the first set treated me so brutal when you came in I judged you as the rest off course—I do say no one lived a better life then I did before—Since my disposition not the same—I though think It will If my work easer as I rested some this week and quite different—Trusting you will help me or tell anyone would help, again I close"

As will be seen from the outline, the types of insanity

are grouped according to the conditions which produce them. Thus, general paralysis is a type of syphilis of the brain. So we have the insanities that go with cerebral arteriosclerosis, that go with alcoholism, with pellagra, with the intoxications; and the psychoses that go with fever and the various bodily diseases. Then we have senile dementia which comes on with the atrophy of the brain tissues due to old age. All these types of insanity depend for their manifestations on the underlying causes.

Because so many types of insanity are congenital or inherited, it is important that the public be better educated than it is today on the matter of what constitutes insanity in order that the insane may be kept from multiplying or propagating their kind. It is a mistaken kindness to permit people who can bring into the world only diseased offspring to marry and bear children.

A general knowledge of insanity is of importance in order that people in general may learn that overwork, mental exhaustion, and the like, produce conditions of mind that are decidedly bad, that is, some conditions of mental disorders are produced by unhygienic modes of life.

And, third, the matter of instruction about insanity is of importance in order that the beginnings of mental disease may be recognized and treatment promptly instituted, for in most cases treatment only at the beginning is worth while.

For these reasons the movement to establish intelligence tests and examine all questionable children is vital, because only when the defects of such children are recognized is it possible to grade them correctly, to put them under the right environment, and thus to make the most of such mentality as they possess. Too many times are whole classes and school rooms kept back because of the presence in the classes of feeble-minded or unbalanced children. In the same way many social movements are instigated

really by the insane, and cause much suffering and sorrow before the leaders in such insane movements are recognized for what they are, and the movement squelched.

Feeble-mindedness may be divided into three grades—that of the idiot, the imbecile, and the moron. The idiot is one whose intellect is that of the newborn infant, *i. e.*, there has been a total arrest of mental development. The imbecile is one who has the mental development of an infant, *i. e.*, the development proceeds for a few months at the most. The moron is one whose mental development has stopped at eight to twelve years of age. That there is a wide spread of feeble-mindedness was shown in the World War by the intelligence tests, showing that some 40 per cent. of our soldiers had not passed beyond the intelligence belonging to a youth of fourteen to sixteen.

For the most part, these cases of feeble-mindedness cannot be helped, *i. e.*, it is accepted that they have reached the limit of their development and they should be utilized for what they can do, and their lives made as happy as possible by putting them into appropriate activities. Of course, the idiot can do nothing. But the imbecile can do simple tasks; while the moron makes a fairly good hand-worker.

Probably the most interesting of the independent or idiopathic forms of brain disorders is **dementia præcox.** This is partially due to the fact that for the present we do not know its origin or cause or its real character. What we do note is that a boy, for example, at the age of puberty who up to that time had been interested and bright and doing well in his studies, rapidly changes his entire character. Instead of being sunny, he is sullen. Instead of being bright, he is careless and indifferent to his school work. Instead of being fond of society and his mates, he suddenly begins to go off and moon by himself. He shows no interest in his surroundings. He is careless about his clothing. His emotions become blunted so that

he is indifferent or silly, with serious defects of judgment. He is apt to be negativistic, that is, do just the opposite of what is asked of him. He may have delusions, particularly, ideas of persecution or of grandeur. His condition gradually gets worse until he has to be put into an institution, and there, after some years, he becomes almost a dement. He shows no interest in life and no initiative. Perhaps one in eight of these cases recovers to the extent that the disease no longer progresses, but even they never do recover their intellectual powers or poise.

In the asylums for the chronic insane nearly half of the inmates are suffering from dementia præcox. In the receiving institutions one-quarter of the inmates are suffering from this disorder. The perception, orientation, and consciousness of the patient are not affected. There are hallucinations and illusions of the sight, hearing, and feeling. The patient is easily led from one thought or purpose to another. He lacks an interest in his surroundings. His memory, however, is good. There is usually a flight of ideas. There is a tendency toward sterotypy of word and action—a tendency toward repetition. The patient, however, is unable to come to decisions promptly or judge easily. He may or may not have delusions, but his emotional life becomes monotonous and dull. The power to will and execute is weakened—it may be completely overcome by negativism, *e. g.*, when a patient is expected to extend his hand in greeting, he puts it behind his back; or, when he should stand, he sits still, etc. In general, he is unable to accomplish much at work. The intellectual faculties and the bodily symptoms vary with different individuals. Since, then, the disease attacks the association fibers, and the very centers of consecutive mental activity, it is an exceedingly serious disorder. The end is usually mental enfeeblement and death. Persons usually reach the asylum at about their thirtieth year, although the disease has usually existed long before that. In fact, the hebephrenic form is

characterized by its beginning before the patient's twentieth year.

The **paranoiacs** are interesting in that they show little or no deterioration of intellectual power. The disease is characterized by the development of suspicion, of ideas of persecution, of delusions. They work out elaborate and logical schemes to prove how they have been thwarted, and how the world is set against them. It is difficult for them to live permanently in any community because sooner or later they attach to those with whom they associate ideas of persecution and enmity. During all this time the paranoiacs are correct in their own conduct, have adequate emotional reactions, and show clearness and logical sequence in their trains of thought. Naturally, they constitute one of the most dangerous types of the insane because they do not deteriorate mentally and can persuade others to follow their lead, and they can put through all sorts of wild schemes to fit in with their fixed ideas of persecution.

The psychologic peculiarity of *paranoia* is that no part of the mental processes seem to be attacked except the association of ideas, and this only to the extent of permitting the development of a "fixed idea." This is really the exaggeration of a normal process, for the association of ideas itself is simply the referring and comparing of new percepts with old ones as standards. Thus, because of previous fright or previous imaginings, some people cannot go near the edge of a bridge or the eaves of a house without being impelled to throw themselves over. The normal man resists the impulse, but the man with a weakened mind must yield. The idea of throwing one's self over is then called an "imperative idea." Similarly, by brooding over his misfortunes, a man may come to believe that he is being defrauded of his rights. Soon some one in particular does him an ill turn and he immediately connects this person with all his misfortunes and believes himself the victim of persecution. When all

subsequent events are judged in the light of this idea, or persecution, we speak of the idea as a "fixed one." The patient usually goes on enlarging and making more systematic his ideas of persecution until his whole life is dominated by them, and he finds himself unable to live at peace with his neighbors and associates. When this stage is reached, he must, of course, be put into an asylum. Sometimes under the influence of the rest and freedom from irritation they regain their balance and are able to re-enter society. However, the most of the paranoiacs do not reach the asylums, but remain at large to temper the peace and happiness of their associates. It must be remembered that these people are logical in their mental processes, and that the only difference between their mental operations and those of their neighbors lies in the sovereignty of the fixed idea and in the wrong premises on which their reasonings are based.

The **psychopaths** are patients with some part of the personality either undeveloped or degenerated. Thus, there are those who have not the strength or resistance for the burdens of life, and who are forever disappointed, complaining—mental invalids. Then, again, we find patients who are possessed by imperative ideas which drive them to theft, to arson, and even to murder. Some psychopaths dare not walk alone through an empty street (agoraphobia), but feel safe in a crowd. Others have nervous attacks and even convulsions if left in a closed room (claustrophobia). Others fear contamination, infection, and even dirt (mysophobia). The kleptomaniac must steal articles, regardless of the need or use for them. Then we find the sexual degenerates. Some of these are excited by seeing or handling clothing or locks of hair of members of their own sex (homosexuality). Again, there are those who find pleasure in torturing children or in being maltreated by members of the opposite sex, etc.

Dementia paralytica, or **paresis,** or general paralysis, is accompanied by a general shrinking in volume and

change in the histologic character of the brain substance. It is caused by syphilis and develops fifteen years or more after the receipt of the original infection. It, therefore, occurs in middle life. It begins generally with disorders of memory, exaltation (or depression), and the flight of ideas. In contrast to dementia præcox the perception is weakened and inhibited, and the attention is also weakened, so that the patient cannot grasp the situation or know what is happening about him. Consciousness is also clouded—the patient is not clear as to himself, as to time, space, etc. He is easily fatigued. However, he has few illusions or faults of the senses. The memory is rapidly destroyed. Speech becomes difficult and inaccurate—the patient cannot correctly pronounce difficult phrases. The pupils are apt to be unequal and unresponsive. The emotional nature gradually disappears. Perhaps the most noticeable symptom of paresis is the delusion of grandeur wherein the patient believes himself possessed of inexhaustible stores of wealth and power. In fact, quite often he believes himself to be God. In the beginning it is difficult to differentiate the disease from neurasthenia, but the later developments clear up the diagnosis. Thus, in the beginning we find a frugal, good-natured man becoming careless, peevish, irritable, violent in temper, extravagant, foolish in investments, and more or less openly immoral. He is inattentive to his work, tires easily, and lacks concentration. He is garrulous, egotistic, and loud in voice and manner. Finally, however, the diagnosis becomes evident when delusions of grandeur and lapses of memory begin to occur, and he makes errors in calculating, and his handwriting becomes uncertain and his speech difficult. The dementia gradually becomes more apparent, and the patient neglects personal cleanliness and cannot care for himself. He may be carried off early by an apoplectic attack or may remain for years a helpless dement. He does not recover.

Another great group of insanities belong to the manic-depressive psychoses. In this disease there is a swing from exaltation to depression, from mania to melancholia. As the outline above indicates, one may have all sorts of types, from the manic to the circular, the mixed to the stuporous.

The **manic-depressive insanity** is a remittent disorder of early middle life, beginning sometimes as early as the twenty-fifth year and lasting into the fifties. It attacks more frequently women. The attacks may be either maniac or melancholic in type, or the one type may alternate with the other. The length of an attack is a matter of only a few months. The interval lasts about twelve to sixteen months, although under careful treatment the attacks may entirely disappear or recur only under special stress of mind or body. The prognosis, therefore, is not always bad. The treatment is institutional, and is devoted especially to building up the body weight by hydrotherapeutic and dietary regulations.

Epileptics suffer a progressive mental deterioration as their disease advances. Either they are indifferent to all that occurs about them and then break out into spasms of causeless rage, or they are peevish and fault finding, jealous, egotistic, and variable. Naturally, they become unable to live with their families and in community life. Their epileptic attacks are attended with amnesia (that is, temporary loss of memory), so that during such times they may travel and do many things of which they have no knowledge when they awake. "Absence" is the term applied to the arrest of all psychic functions: "The patient suddenly becomes immovable, his gaze fixed, his expression vacant; the attack having passed, he resumes his work or occupation at the point where he left off." Sometimes, however, the patient may go through automatic movements during a prolonged "absence." Thus, a barber may continue to ply his tools, even though his mind be a blank. Epileptiform attacks are not confined

to epilepsy. On the other hand, epileptics have other seizures which are not convulsions, but which are equivalent to such convulsions. Thus, going on a drunken spree may be for an epileptic the equivalent of a seizure.

The **psychoneurosis** group includes those disorders in which mental forces or ideas of which the patient is either aware or unaware bring about various mental and physical symptoms. In other words, these disorders are essentially psychogenic in nature. The term "neurosis" is now generally used synonymously with psychoneurosis, although it has been applied to such disorders in which, while the symptoms are mostly mental and physical, the primary cause is thought to be essentially physical. In most instances, however, both psychogenic and physical causes are operative, and we can assign only a relative weight to the one or to the other. We have the hysteric type of psychoneurosis in which there are deliria, stupors, dream-stages, mental conflicts or emotional experiences detached from ordinary consciousness. There is a tendency to split up the personality. It is this group of psychoneuroses that are helped sometimes by psychoanalysis. And it is this group about which the Freudian theory has so much to do. The idea is that people who repress certain desires or wishes thereby create within themselves warring forces, and this war may translate itself into bodily pains and aches and misdoings. When the factors are brought to the knowledge of the subject then the warfare subsides and the bodily results disappear.

Psychasthenia refers to the compulsive and obsessional neuroses of some writers. The phobias, the obsessions, the morbid doubts and impulses, the feeling of insufficiency, the nervous tension and anxiety, all belong to this group. Episodes of marked depression and agitation may occur. There is no disturbance of consciousness or loss of memory as in hysteria.

Neurasthenia is a psychoneurosis in which physical and mental causes both figure. Extreme fatigability of

the mind is common in neurasthenia. There is irritability as well as mental and motor fatigability. There are various hyperesthesias and paresthesias, hypochondriasis, and various degrees of depression.

The anxiety neuroses were very prominent in the World War. This is a clinical type in which morbid anxiety or fear is the most prominent feature. The general nervous irritability or fatigability is regularly associated with expectation or dread. In addition, there are numerous physical symptoms which may be regarded as the bodily accompaniment of fear, particularly cardiac and vasomotor disturbances. The heart action is increased. Often there is irregularity and palpitation. There may be sweating, nausea, vomiting, diarrhea, suffocating feelings, dizziness, trembling, shaking, difficulty in locomotion, etc. Fluctuations occur in the intensity of symptoms, the acute exacerbations constituting the anxiety attacks. After removal from the source of the anxiety and irritation, and given rest and reassurance, these patients usually recover.

Hysteric insanity seems to lie in the reaction—the ability to will and to do. The presence of imperative as well as fixed ideas is often demonstrable. The treatment is, of course, that of re-education.

Severe fright results in the upsetting of the normal routine and control of the mental processes, and patients find themselves unable to do some things and go some places that they should normally. The treatment is the same as in hysteria. The prognosis depends upon the original health and constitution of the patient.

The **treatment of insanity** is largely empirical because as yet we have very slight knowledge of the processes leading up to the various disorders. In general, the treatment is symptomatic and aimed at giving the patient calmness and quiet. For mania we find immersion in warm baths more effective than mechanical restraint. The tubs are made so as to afford little or no opportunity

for the patient to do himself damage in them. The water is kept at a temperature just above that of the body. The patient is immersed up to his neck and the surface of the bath covered with a sheet. He may remain in the bath twenty-four hours or more at a time.

On the other hand, in melancholia there is a depression of the activities of the body and mind and even of the metabolic processes. Therefore, in such patients there is necessary stimulation instead of depression, and we give, therefore, electric treatment, hot baths, with massage, highly nutritious foods, coffee, and other stimulants. If they refuse food, the melancholiacs have to have food put into their stomachs by tubes through the nose. And for this purpose mixtures of raw eggs and milk are most effective.

The lack of sleep is one of the most distressing symptoms of the insane and is the one that they complain of most. It is necessary to combat it usually directly with drugs, and one uses everything from chloral down to phenobarbital and other newly developed products. But in general one tries to avoid the use of such depressants and tries to soothe the patients by the diversion of the mind, by the use of massage, and especially by music.

Fixed ideas and imperative ideas are not gotten rid of by argument. It requires usually the passage of considerable time and the quieting of the mind before the patient will give up such ideas. They should not be punished for having those ideas, but should be put where the having of those ideas will do no damage and given the opportunity to let the somatic processes go on as smoothly as possible until these delusions disappear.

Intracranial Tumors

The brain is subject to tumors the same as the rest of the body. They cause headache and disturbance of the function of the parts supplied by the corresponding nerves. This disturbance is usually in the form of

convulsions, followed later by paralysis. Other symptoms are found in the eyes, which show the effect of interference with the nerve centers in almost any part of the brain. Since these tumors are fatal unless they can be removed, the matter of their treatment becomes simply a matter of relieving the patient of pain and distress until the surgeon can operate.

The treatment in general for all organic lesions is to keep the patient quiet and relieve the distress. This latter can sometimes be accomplished by the use of heat, either in the form of local applications or hot-air baths, but quite generally it requires powerful drugs. During all this time the nurse must keep the patient's body in good condition by massage, careful feeding of nutritious and easily digested foods, such as peptonized milk and eggs, custards, junkets, scraped steak, etc., and by keeping the bowel clean by the use of enemata (if the physician does not wish to use cathartics).

CHAPTER XXXII

THE INTOXICATIONS—STINGS—BITES

The Intoxications

In 1920 there were 957 deaths from food poisoning, a rate of 1.1 per 100,000. There were 1227 deaths from so-called blood-poisoning (septicemias), a rate of 1.4. Chronic lead-poisoning showed a rate of only 0.1 per 100,000; while the other occupational intoxications together showed a rate of still less than 0.1. Deaths from the use of morphin, cocain, etc., ran about 0.3 per 100,000. In 1923 the figures were:

	Deaths.	Rate.
Chronic lead-poisoning	141	0.1
Alcoholism	3148	3.2
Food poisoning	928	1.0
Septicemias	1340	1.4

These figures, of course, have to be interpreted in the light of experience, which shows that most of the drug habitués die of intercurrent disorders.

The rate for alcoholism was 4.7 among the policyholders of the Metropolitan Life Insurance Company, divided by age thus:

Age.	Rate.
1–19	0.1
20–24	1.0
25–34	6.2
35–44	14.2
45–54	13.9
55–64	10.2
65–74	8.4
75 and over	4.8

As might be expected the rates are higher for men than for women and for colored than for whites.

Alcoholism and the Drug Habits.—The narcotic drugs are those which stupefy the higher centers of the brain and leave for a time at least the lower centers without the control of conscience and circumspection. For instance, cocain takes away all sense of fatigue, and lets the motor influences run riot. Alcohol removes all sense of shame and reserve and gives the feeling of being able to do great things. Morphin leads one to forget the actual and dream dreams and see visions. Hence, the narcotics are in demand among all those who, depending for happiness on outside things, are necessarily meeting with disappointment. The action of these drugs which makes their use of interest to the physician rather than to the clergyman is that they are habit-forming drugs, and gradually weaken the body as well as the mind.

Alcoholism.—It takes only 15 c.c. of alcohol to affect the brain and render it inaccurate in observation and thought. This amount is found in less than a pint of 4 per cent. beer, in about 3 ounces of the ordinary red wine, and in less than that amount of port wine. Of whiskey, an ounce would easily show its effect on an average normal brain. The effect of alcohol does not pass off from the brain for some forty-eight hours. Hence, small amounts of alcohol taken daily produce a permanent weakening of the activity of the finer centers, and the individual is unfitted to pass judgment on matters calling for the exercise of a fine moral sense. After a time the steady use of alcohol influences the coarser fibers of the nervous system, and we find the user subject to acute insanity (delirium tremens, mania à potu) and also to affections of the digestive and circulatory organs.

The different alcoholic preparations produce different effects on the body itself. Thus beer weakens the heart and liver by making them "fatty." Whisky produces a chronic gastritis and cirrhosis of the liver. All the alcoholic drinks gradually injure the kidneys, so that the drinker is liable to the diseases caused by high blood-pressure. For this reason the treatment of alcoholics

has to consider not only the nervous system but also the "lower" organ systems.

Since the days of federal prohibition there has been added to the normal damage done by alcoholic drinks the special damage done by the fusel oils, wood alcohol, and similar adulterants of the usual alcoholic liquors. This damage is especially noticeable in the liver as well as on the brain. The effect of these drinks is so violent that there is often produced a coma (or unconsciousness) which ends either in death or in permanent disability because of the damage to some of the organs.

Treatment of Alcoholism.—The drug must be withdrawn, the injured tissues protected from injury, and new habits of life formed. This cannot be done quickly, so that three-day "cures" for alcoholism form at best only the beginning of a cure. For many of the delicate cells in brain and nerve have been destroyed and their places taken by connective tissue. Therefore, it is wise to place the patient in a sanatorium and let him gradually learn to meet the temptations of life, rather than simply give him medical treatment at home and expect him to withstand temptation as soon as the drug has been removed. One should reckon on at least a year of careful supervision before expecting a patient to be able to resist temptation, or even to be strong enough to take his place in the world of workers.

The cure itself, as now practised, consists in withdrawing at once the alcohol and then using other stimulants to keep up the patient's strength until the good food and rest start the rebuilding of the body on a healthy basis. Thus, every morning the patient might be given heavy doses of Rochelle or Epsom salts; he should be given food and water every two hours, followed for a few days at least by digestants and nux vomica, or other gastric stimulant. Naturally, the patient should be in bed or on a couch most of the day until his weight begins to increase steadily. Here, again, baths and sprays and

massage are very helpful in calming the mind and in building up the body.

Morphin Habit—The morphin habit requires similar treatment, for the patient is in similar mental condition. As far as the physical condition is concerned there is less liability to fatty degeneration of the liver and heart, but the body as a whole is more emaciated, the skin is dry and coarse, and the response to treatment less prompt. The morphin habit is peculiarly destructive to the moral fiber of its victim, so that he rarely can tell the truth—even when it would be to his advantage to do so.

Cocain Habit.—The treatment for the cocain habit resembles the two preceding, being different only in the particular drug used by the physician to keep the patient subdued while suffering from the withdrawal of the cocain.

Thus, as far as the physician and nurse are concerned, the drug habits are chronic intoxications which have affected more especially the nervous system. The duty of the medical treatment is to prevent the patient from being further poisoned by the particular drug from which he is suffering, to eliminate the poison already stored up in the system (and there is much of it), and to regenerate as far as possible the tissue damaged by the disease. It is also the duty of the nurse to keep the mind of her patient busy and cheerful; to prevent exposure to temptation, and to utilize every opportunity of building up new moral fiber.

The growing fear of pain and the wrong ideals of life are largely responsible for the increase in the number of drug habitués. There is need of inculcating in children greater hardihood and the ideal of serving rather than of being served, if we would do something toward stemming the tide of narcotism.

Food Poisoning.—Ptomains are basic compounds resembling the alkaloids formed by the action of bacteria on animal and vegetable tissue. Some are only slightly

poisonous, but others are more poisonous than strychnin or atropin.

There are two distinct types of poisoning from food-stuffs. The one is due to the bacteria contained in the food (since these may generate toxins in the body), and the other is due to the ptomains or toxins already generated in the food-stuffs. The first, of course, acts as a bacterial infection and exhibits the symptoms of intoxication only after an incubation period of one or more days. But the effects of the second type are immediate; for the ptomains are usually free in the food and begin to poison the body as soon as swallowed; or they may be liberated by the digestive action of the stomach and intestines, in which case the effect is delayed for a few hours.

It is not always possible to tell from the appearance of meats whether or not they are poisonous; one must know something of their history and that of the animal from which they came. For these reasons cooking thoroughly is always necessary, especially in case of sausages, meat pies, etc.

Now that we are consuming many preserved foods, such as canned vegetables, and bottled olives, etc., there have arisen a goodly number of cases of intoxication from vegetable food-stuffs also. Consequently, it is important to watch not only the food of animal origin but also the preserved foods of vegetable origin.

The intoxications from food are characterized by the fact that in them all the gastro-intestinal tract and the nervous system suffer most. There is usually vomiting, retching, colic, purging, or obstinate constipation. The participation of the nervous system is shown by the disorders of sight (double vision, inability to raise the eyelids (ptosis), etc.), and glossopharyngeal paralysis. The temperature may be normal, subnormal, or elevated. The heart is more regularly affected—the pulse being rapid and weak.

The bacterial poisonings from meat take the form of a violent enteritis in many cases like paratyphoid fever

(which resembles typhoid fever, but does not give the Widal reaction). They must, therefore, be treated by carefully cleansing the bowel, allowing little or no food for a day or two, and then by stimulants (hypodermically) and warmth keep the patient alive until the bacterial invasion shall have been overcome.

Ergotism.—Ergotism is the form of intoxication due to the eating of rye spoiled by ergot (claviceps purpurea). This occurs usually in those years when on account of wet weather the crop is light and the people who are dependent upon rye for their bread have nothing but this moldy grain. For ergot is a mold or fungus that grows on rye. It betrays its presence by the dark (purplish) color. It is used in medicine to raise the blood-pressure and to cause the uterus to contract. The disease is most frequent among-the peasantry of Eurpoean countries, but it has appeared also in America. Here, in contradistinction to the onset in other forms of food poisoning, the symptoms do not appear until the spoiled grain has been used for some weeks. The symptoms are increasing emaciation, nervous tremors and pains, and finally gangrene of the extremities. The treatment is, of course, to give the patients highly nutritious food, rest in bed, and massage and baths to the affected parts of the body.

Mytilotoxism.—Mytilotoxism results from the eating of spoiled mussels. The first symptoms is the rash, like that of scarlet fever, which may be followed by convulsions and even death. The treatment is to empty the stomach and bowels, promote elimination by way of the skin and kidneys by the use of hot packs, and to stimulate the patient until nature can reassert herself.

Ichthyotoxism.—Ichthyotoxism is the name applied to poisoning from eating spoiled fish. The pupils are dilated. There is violent pain, especially in the epigastrium, and a rash finally appears. The same general line of treatment applies.

Kreotism.—Kreotism results from eating unfit meats; most frequently sausages, meat pies, and mincemeat, be-

cause into these concoctions meat unfit for inspection and sale is usually tucked away. The symptoms are similar. Here, again, very active catharsis with stimulation by coffee and hypodermic injections is indicated. The patient is generally so weakened by such an attack that days of convalescence are necessary.

Tyrotoxism.—Tyrotoxism refers to the poisoning following the ingestion of tyrotoxicon, the ptomain from milk, ice-cream, cheese, etc. This has seemed to be on the increase, and has been one of the factors leading to the demand for pure food legislation. The symptoms are the same—pain, vomiting, prostration, etc.

Botulism.—The Bacillus botulinus was described in 1896 by Van Ermengen. The symptoms of the poisoning appear in sixteen to forty-eight hours after the eating of the food, although occasionally the symptoms may appear in three or four hours. The cases which develop early usually show profound abdominal symptoms, such as vomiting, nausea, and purging. This last condition, however, is likely to be followed by an obstinate constipation. Frequently, there is a paralysis of the muscles of the eye so that the patients show dizziness and the eyeballs show a constant movement (nystagmus) and there is pain from light. There may be also a partial paralysis of the laryngeal muscles and those of the palate, with an impaired action of the pharynx. Therefore, difficulty in swallowing may be noted and even the voice may be lost. Muscular weakness appears, but it is not like true paralysis. The secretions are diminished. The mouth is dry. The urinary output is usually diminished. The temperature remains normal unless a bronchial pneumonia develops which would, of course, change the picture of the disease.

The mortality may reach 50 per cent. An instance is the case of 200 people who attended a banquet near Canton, Ohio. Of these, 14 developed botulism from eating infected ripe olives. And of these 14, 7 died.

Sunstroke.—Great heat with great humidity are apt to produce the conditions known as heat exhaustion, sun-

stroke, thermic fever, insolation, and siriasis. Physical exhaustion, hunger and thirst, weakness of kidneys, and alcoholism are predisposing factors. The symptoms are vertigo and oppression, followed by coma with or without convulsions. The face is livid and cyanotic, the breathing is stertorous, the pupils are fixed. (They may be either contracted or dilated.) The fever has been said to reach even 112° F. in sunstroke, while in heat exhaustion the temperature is subnormal and there is sweating and collapse. Sunstroke may produce death in a few hours. Relapse is common, and the sequelæ of discomfort when exposed to warmth may last for years.

Treatment.—The important thing is to recognize which of the two forms of heat exhaustion we have—*e. g.*, whether the temperature is subnormal or very elevated. In the first case stimulation and the usual treatment for nervous shock must be applied. In the second form the body must be rapidly cooled by the application of ice or flowing water (*e. g.*, stream from a garden hose). In both forms, however, the patient should be stretched out flat in the open air, but in the shade, and stimulants administered. Aromatic spirits of ammonia, strychnin, coffee, *et al*, may all be used.

Treatment of Acute Poisonings.—The first thing to do when we find a patient who has swallowed a poison is to try to empty the stomach of all the unabsorbed poison. If we have reason to believe that all the poison is absorbed, then we should turn our attention to neutralizing it and to keeping the victim alive. But in most cases it is well to begin our treatment by emptying the stomach. The quickest way to do this is to use the stomach-tube and flush out the stomach with milk, if we are dealing with a corrosive poison such as carbolic acid; or with water if the poison be from putrefaction; or with a 1 per cent. solution of potassium permanganate if the poison be morphin or opium; or with soda or other alkaline if the poison be an acid; or with weak vinegar or other acid solution if the poison be an alkali, etc. In case no special

solution can be had quickly or while such a solution is being made, flushing the stomach with clear water will be helpful.

In order to neutralize the poison already absorbed we must know pretty accurately what it was. For instance, alcoholic drinks by the mouth and hypodermic injections of atropin (1/50 grain) are useful in morphin-poisoning. For strychnin, hypodermic injections of nitroglycerin (1/50 grain), inhalation of amyl nitrite, swallowing of tannic acid and sodium bromid solutions.

More, however, can be hoped for by one not a trained physican from efforts to keep the patient alive until help can come. Thus, when the victim seems almost gone, artificial respiration should be used by having the patient flat on his back, and then compressing rhythmically the lower ribs at the rate of about fourteen compressions to the minute. With strong and burly men it may be necessary to use the arms as levers, swinging them up and outward and then back over the chest. Children may be kept breathing by raising the legs by the ankles until the back is bent and the abdomen compressed. If, however, as in the case of drowning, there is something in the trachea or lungs, the patient should be put on his face and raised over a roll of clothing or a barrel, alternately by the lower ribs and shoulders. Sometimes the breathing can be maintained by slapping the chest with ice-cold water—doing it rhythmically as in all methods of artificial respiration. Again, pulling the tongue rhythmically may help keep the respiration going. The rate should be that of normal respiration, *i. e.*, about fifteen to the minute.

In opium- and morphin-poisoning the danger is in letting the patient go to sleep. After his stomach has been emptied and he has been given hypodermics, strong coffee should be given him and he should be compelled to walk—under the lash if necessary—until the danger is passed.

Ptomain-poisoning is very common, and should be met with prompt treatment. The stomach and bowels should be evacuated. A hypodermic of 1/10 grain of apomorphin,

followed when the vomiting has subsided by plentiful doses of castor oil and salts, will do much toward accomplishing this. The type of poisoning is usually that of belladonna (atropin), with its dryness of the throat, rapid heart-beat, etc. For this reason hypodermics of pilocarpin ($\frac{1}{3}$ grain) and sweat baths (hot packs) will be found useful. Artificial respiration should be kept up a long time when needed (even two hours, if necessary).

Bites

Snake-bites.—We quote here the excellent advice given by Vorhies in the Bulletin of the University of Arizona:

"First of all, notwithstanding a firmly rooted popular conviction to the contrary, *whisky is not a remedy*. It is not only useless, but absolutely harmful, especially if given in large quantities, as is the usual tendency. If you want to finish the job begun by the rattler, take plenty of strong alcoholic stimulant. Small doses at the proper time *may* be of service. The facts as to whisky treatment may be reassuring only to some persons who find themselves in a rattlesnake country where bottled 'snake-bite' is taboo.

"If one would be prepared to deal properly with snake-bite let him carry when in the open at least the following equipment, which should be on the person to be effective, not half a dozen miles away in camp, cabin, or auto.

"1. A very sharp knife or razor. Best, because it is least bulky and can be kept clean, is a good safety razor blade. This could easily be carried sterilized in a waxed-paper wrapping.

"2. A small vial of crystals of potassium permanganate.

"3. A rubber band, of sufficient size and strength to be used as a ligature without the delay of tearing strips of cloth, tying knots, twisting, etc.

"These are the most important—the essential—things. Absorbent cotton, sterilized, gauze, and some one of several antiseptic solutions are next in usefulness. A hypodermic

syringe and strychnin tablets may be valuable for those who understand their use, but if the other things are near at hand at the moment needed, these are not so likely to be wanted.

"Now for the procedure to be followed in the event of being bitten:

"1. *Keep cool*, life depends on it.

"2. Place a ligature above the wound *at once*. If bitten on a finger, ligate only the finger. If on hand or arm, or on foot or shank, place the ligature above the elbow or knee, where there is but one bone in the limb. If the rubber band is on hand much time will be saved for the next step. If not, apply a ligature (tourniquet) of cloth and twist it sufficiently to cut off circulation in the limb. Do not leave a ligature in place for more than twenty minutes, or thirty at the very outside, lest mortification of the limb begin.

"3. As quickly as possible after being struck, but only after applying the ligature, cut across the fang punctures for about 1 inch, both ways, *deeper* than the fangs penetrated. If bitten on the finger, cut to the bone at least lengthwise. Look out for tendons in a cross-cut on the finger.

"4. Bleed the wound as thoroughly and rapidly as possible. If sucking the wound aids bleeding, *suck it*.

"5. After some good bleeding wash the wound *thoroughly* with potassium permanganate—enough in water to produce a deep wine color. If without water, as might well be the case in the desert country, rub some crystals into the wound, aiding their solution with saliva. This chemical specifically destroys all the venom with which it comes in contact. There are other substances which will do this, but their action on the flesh is more injurious. If you have water, use it, as the use of crystals is rather more likely to injure the flesh than the use of solution.

"6. Remove ligature.

"7. At this point *small* doses of whisky as a stimulant

may be useful. Hypodermic doses of strychnin act as a powerful stimulant and may be used by those properly equipped if fainting spells indicate a need of such.

"The wounds made in the drainage process should be dressed as carefully as circumstances permit, using for this purpose the surgical dressings and antiseptic solution for a wet dressing, if at hand. If these are not available, keep the wound as clean as possible until a physician can be had to apply proper dressings. In any case have a physician care for the wounds, for the deadening effect of the poison on the natural defenses of the blood makes the part extremely liable to germ infection, such as blood-poisoning. Since the permanganate can only act against the poison with which it comes in direct contact, *it is useless after the venom has become disseminated in the blood.* Hence the importance of immediate action for beneficial results."

Stings

The sting of the honey-bee, which usually remains in the wound, should be removed by scraping with a knife-blade or finger-nail, not by grasping, the latter method resulting in forcing more poison into the wound. For stings of bees, wasps, and ants alkalines, such as ammonia or soda, are generally recommended, but are of little value and should not be rubbed in if applied. Wet cloths as hot as can be borne will afford relief, and "the application of wet clay or of the end of a freshly cut potato is sometimes helpful" (Riley and Johannsen).

The history of a tarantula bite is as follows: The arm became much swollen to the shoulder and became discolored with suffused blood, that is, black and blue. The more serious results lasted two or three days, but a state of depression lasted for some time. And complete recovery occurred after some weeks This case occurred in the daytime when the laborer accidentally brought his hand in contact with a tarantula while turning over a stone.

CHAPTER XXXIII

DISEASES DUE TO MALNUTRITION: PELLAGRA—RICKETS—SCURVY—GOUT—OBESITY

Pellagra

Pellagra is a disorder primarily of the skin, but it is accompanied by a slowness of cerebration and an upset of the digestive tract as well as general weakness and emaciation.

As its name indicates, it originated in Italy, but it is to be found in the southern part of the United States as well as other countries of similar latitude. It seems to be due to a monotonous diet or a diet deprived of certain important elements called the vitamins. Consequently, it has been most prevalent in almshouses and other institutions where the diet has been arranged rather with a reference to the ease of obtaining it or cheapness than to its adequacy or balance.

The skin changes appear usually in the backs of the hands and wrists and the lower chin. Also there is a change occurring on the cheeks over the cheek bones. These changes include a darkening of the color of the skin, a thickening and to some extent a roughening and inflammation of the skin. It is very similar to what the Missourians call "tetter." It is most prevalent in the spring and fall, least prevalent in the winter.

In 1923 the Census Bureau reported 2352 deaths from pellagra, a rate of 2.4. It would seem, therefore, that the disease has become less prevalent than a decade ago.

Symptoms.—The primary symptoms comprise general malaise, constant cerebrospinal pain, mental dulness, pallor, a peculiar staring facies, progressive emaciation, irritability and insomnia, together with a patchy and varying erythema lasting for a few weeks only, to disappear and leave behind a rough skin, stained light sepia. The other symptoms last through the winter, while the spring is associated with a full development. This takes the form of moderate dyspepsia—both gastric and intestinal, more or less severe diarrhea or actual dysentery, and a peculiar remittent but progressive erythematous rash affecting the exposed surfaces of the body and followed by desquamation. This dark red rash is particularly well marked on the neck, hands, and exposed parts of the body. The palms of the hands are usually free. There are periods of desquamation in which the deep red becomes a livid blue. The skin finally becomes thin and lifeless and the course of eruption may be varied by vesiculation, suppuration, fissures, or the formation of crusts, or takes on a macular form. Summer brings a remission. The following spring or, in our own country, the fall, comes a relapse, and finally cachexia appears associated with disorders of the special senses and of the mind, spastic paralysis of the leg, associated with atrophy and contracture, normal superficial reflexes, and increased knee-jerks. The cerebrospinal pain is intense and associated with troublesome paresthesia and maddening hyperesthesia. Anemia and emaciation are profound.

Unless it has gone too far, this disease is quite curable by changing the diet and regulating the life of the patient. The most important thing in the way of regulating the patient's life is to see that the colon and bowels are thoroughly emptied every day and kept in good order by colonic irrigations.

The diet calls for fresh uncooked vegetables rather than the canned or preserved ones or monotonous cereals. Consequently, raw cabbage, raw carrots, and even raw

VITAMINS IN FOODS

	"A"	"B"	"C"
BREAD, WHITE (WATER)	?	+	—
" , " (MILK)	+	+	?
" WHOLE WHEAT (WATER)	+	++	?
" , " " (MILK)	++	++	?
BARLEY (WHOLE)	+	++	—
CORN, YELLOW	+	++	—
OATS	+	++	—
MEAT, LEAN	— to +	+?	+?
BEEF FAT	+	—	—
MUTTON FAT	+	—	—
PIG KIDNEY FAT	++	—	—
OLEOMARGARINE	+	—	—
LIVER	++	++	+
KIDNEY	++	++	+?
BRAINS	+	++	+?
SWEETBREADS	+	+	*
FISH, LEAN	—	+	*
" , FAT	+	+	*
" , ROE	+	++	+?
MILK, FRESH	+++	++	+V
" , CONDENSED	+++	++	+V
" , DRIED, (WHOLE)	+++	++	+V
" , SKIMMED	+	++	+V
BUTTERMILK	+	++	+V
CREAM	+++	++	+V
BUTTER	+++	—	—
CHEESE	++	*	*
COTTAGE CHEESE	+	*	*
EGGS	++	+	+?
ALMONDS	+	+	*
COCONUT	+	++	*
HICKORY NUTS	*	++	*
PEANUTS	+	++	*
PECANS	*	+	*
WALNUTS	*	++	*

	"A"	"B"	"C"
TOMATOES (RAW OR CANNED)	++	+++	+++
BEANS, KIDNEY	*	+++	*
" , NAVY	*	+++	—
" , STRING (FRESH)	++	++	++
CABBAGE, FRESH, RAW	+	+++	+?
" , COOKED	+	++	+?
CARROTS, FRESH, RAW	++	++	++
" COOKED	++	+	+
CAULIFLOWER	+	++	+
CELERY	*	+	*
CUCUMBER	*	+	*
DANDELION GREENS	++	++	+
EGGPLANT, DRIED	*	++	*
LETTUCE	++	++	+++
ONIONS	*	++	++
PARSNIP	—?	++	*
PEAS	++	++	+?
POTATOES (BOILED 15 MIN.)	*	++	+?
" (" 1 HOUR)	*	++	+?
" (BAKED)	*	++	+
SWEET POTATOES	++	+	*
RADISH	*	+	*
RUTABAGA	—?	++	+++?
SPINACH, FRESH	+++	+++	*
" , DRIED	+++	++	*
SQUASH, HUBBARD	++	*	*
TURNIPS	—?	++	*
APPLES	+	+	+
BANANAS	+?	+?	+
GRAPE JUICE	*	+	+
GRAPEFRUIT	*	++	++
LEMON JUICE	*	++	+++
ORANGE JUICE	+	++	+++
PRUNES	*	+	—
RASPBERRIES (FRESH OR CANNED)	*	*	+++

\+ contains the Vitamin
++ good source of the Vitamin
+++ excellent source of the Vitamin
— no appreciable amount of the Vitamin
? doubt as to presence or relative amount
* evidence lacking or insufficient
V variable

Prepared by the Propaganda Department of The Journal of the American Medical Association.

potatoes would be well taken. But best of all is the use of a large quantity of raw milk. If the latter is given at

two-hour intervals through the day the patient keeps from overwhelming his stomach with large meals and at the same time secures a better digestion and absorption of the food-stuffs taken in.

Scurvy (Scorbutus)

A disease of malnutrition due to the lack of vitamins in the food is scurvy. This historically was an important disease for shipmasters because when the supply of fresh vegetables was used up the crew suffered greatly from scurvy. Again, in the late war, in the Balkan front, many of the soldiers of the eastern armies suffered from scurvy.

The **symptoms** are spongy, bleeding gums, petechial spots on the skin, and the swelling of the legs due to the inflammation of the periosteum. Consequently, the patients are unable to walk, or are so weak that they cannot stir about, and in the case of children they lie crouched and motionless, crying at the touch of one's hand or upon movement.

The disease leads to death unless some intervention occurs to provide the right sort of foods.

The treatment consists first of all of the supply of, first, juices of fruit, raw potatoes, raw milk, raw cabbage, raw carrots, etc. Raw beet juice also is useful.

Then, second, the patient should be kept as quiet and as comfortable and as warm as possible. In the case of babies, where this disease is now most often found, it is necessary sometimes to pack the body in cotton to keep the child from suffering while waiting for the curative effect of the food.

The cure requires weeks, and consequently very careful attention to the arrangement of the diet is necessary in order that the child may be able to digest it.

Rickets

Rickets (rachitis) occurs chiefly in Europe and North America. It is a disease of the cities. It is most prevalent

in those nations whose wealth and industrial development have brought about most fully the substitution of artificial conditions of living in place of the simple conditions which nature intended. Wherever civilization of this artificial character establishes new contacts, rickets begins to appear. The disease has appeared in India where the designs of nature have been interfered with by religious customs. The disease never occurs among people living under natural conditions. Savages may starve and may become the victims of pestilence, but they do not develop rickets. The disease does not occur in the native parts of Africa and is exceedingly rare in China and Japan. It occurs rarely in the tropics and is rare in the Arctic regions (Parke).

It appears more frequently in winter than in summer.

Rickets is usually accompanied by scurvy. Tetany is also a frequent complication of rickets.

The disease seems to be due to a lack of certain food elements, so called vitamins—and also to a lack of fresh air and sunshine. Either one of these elements can produce the disease. The consequence of this causation—malnutrition—is that the bones do not grow as they should. The epiphyses are swollen and softer than normal. The shafts of the bones are shortened and curved. The bones in the skull show projecting bosses. The fontanels remain open. The line of union between the anterior ends of the ribs and the cartilages of the sternum is shown by a line of beads or knobs, the so-called "rickety rosary." The abdomen is distended and the liver and spleen are enlarged.

The disease may appear as early as three months. In premature children it may appear even earlier.

The **symptoms** are restlessness at night, a sweating of the head until the hair on the back of the head is worn off (craniotabes). There is tenderness of the legs, arms, and in general the skin is tender to touch. Consequently, the child cannot walk, cannot even creep, and any move-

ment of the child's crib or disturbance of the body may cause pain and an outcry.

Death does not occur from the disease itself, but on account of the liability that the patient may take other diseases while weakened by the rickets.

Treatment.—Cod-liver oil has been used from time immemorial as a folk remedy on the coast of Holland, England, and France. It was introduced into France as a specific for rickets. The cod-liver oil causes a rapid deposition of lime salts in the cartilages of the bones of animals studied to show the effect of this drug. No other oil takes the place of cod-liver oil for this purpose. Consequently, the standard treatment is cod-liver oil and phosphorus.

In addition to the cod-liver oil, exposure to sunlight and fresh air is quite important. In fact, one of the causes of the disease seems to be the lack of exposure to sunlight. And this exposure must not take place behind windows because the glass takes out from the sunlight those rays which seem to be most effective in caring for the nutrition of the body. Consequently, one may help these babies affected by rickets by using the ultraviolet rays from artificial sources, as in the quartz lamps.

The food should, of course, contain a large proportion of the green leaves and other vitamin-containing substances—the raw cabbage, the raw carrot, the orange, and raw milk. All should be used in rickety children.

The **prophylaxis** of rickets demands that children should be allowed to play in the fresh air and sunshine more than occurs in the thickly populated parts of our cities. It demands also that raw food should be given children at the earliest possible ages; and that, in general, the conditions prevalent out in the country should be duplicated as far as possible among the children of the cities.

Obesity

At the menopause in women, when the sex glands seem to cease their activity, there is usually an increase in the weight of the patient. Sometimes this weight increase becomes excessive, and then one must treat it as a veritable disease. Such patients are greatly helped by the administration of large quantities of ovarian extract, especially the lutein (corpora lutea). To be of use this must be administered at least one-quarter of the time each month.

Then, again, we find that other cases of obesity due to disorders of the pituitary gland, that is, in the hypofunction of the pituitary. Thus we find obesity in adolescent youngsters with the fat especially about the girdle. This localization also appears in the case of women. In most cases it is the pituitary dysfunction which produces obesity in the young in contrast with the obesity produced by the lack of ovarian function which ordinarily comes in women of middle life. This obesity also is benefited by the administration of the extract of the pituitary gland.

Then, again, we have a form of obesity or thickening of the skin and subcutaneous tissue due to the lack of thyroid extract. This is myxedema, and comes on where the function of the thyroid fails the patient after adult life has set in. This type of obesity is quite common and yields fairly readily to the administration of thyroid extract.

Then, again, we have obesity due to too much food and too little exercise. This is the most common form that we meet on the streets in the United States today. It is the one that shows a need that our people become used to riches. They must learn that no matter whether they can afford it or not, it is unwise to indulge themselves in sweets and rich foods and not to take vigorous exercise. They need to keep the body vigorous even if they do not have to take vigorous exercise to earn money to live by.

Many diets have been made out for these fat people,

but they essentially require (1) the absence of the starches and carbohydrates; (2) the presence of the cellulose-containing vegetables in large quantities, lean meat, a few eggs, and things of that type. Thus the desserts for those people have to be made up of cheese and nuts instead of sweets. They cannot eat bread or potatoes. In fact, the dietary for most of these patients is very similar to that of the diabetic. And it is interesting to note that these overweight people are the ones who are the most liable to become diabetic after years have gone by. For this reason, also, it is wise to call the attention of fat people to the dangers of their fatness, and to urge them to decrease their weight by establishing more nearly a correct relationship between food intake and exercise and energy output.

GOUT

Gout is a disease characterized by a paroxysmal and painful inflammation of the small joints, particularly of those of the great toe, accompanied by the deposit of sodium biurate. The deposit of urates in the joints argues that the blood is overloaded with them. This may mean that the liver does not make them ready for elimination from the body by the kidneys, or that the kidneys, for some reason or other, fail to eliminate them. That there is an excess is due in most cases to high living coupled with deficient exercise, whatever may be the reason why the emunctories do not carry off the excess. Most of the patients suffering from gout have, at some time or other, led a rather vigorous life, and have thus established a habit of taking and using considerable strong food. When now they become inactive, they usually do not decrease their eating and drinking in the proportion in which they have decreased their exercise. Hence, there is a lack of equilibrium which sooner or later shows itself either as gout, rheumatism, or obesity.

Gout is apt to be hereditary. That is, it runs in families. Thus, during four centuries, one family history

showed that out of 535 gouty subjects, 309 had a family taint, that is, about 60 per cent. In another family, out of 156 cases, 140 had a family taint, *i. e.*, about 90 per cent. Whether this is due to something in the bodies of these people themselves or whether it is due to the environment in which the familes had to live is not known.

The attacks usually come on at night, and pass away with the return of day. The joint is swollen, the skin darker than usual, and exceedingly tender. Sometimes bronchitis, asthma, and indigestion of various types attend the attacks. Between the attacks the patient is quite comfortable, and only pays attention to the treatment of the underlying trouble when the attacks begin to come so close together that he cannot quite forget them.

The **treatment** of the attack is the application of warm bandages, absolute quiet, and internally anodynes. A very good local treatment is to apply a warm and moist bandage snugly, and then place enough hot-water bottles and similar carriers of heat around it to keep it warm. The foot should be raised to be on a level with the body. The local application of guaiacol (liquid) is also sometimes helpful. The anodynes used are morphin, atropin, and colchicin.

Between the attacks the patient should become, if possible, more active out of doors. Since, however, most of our gouty patients will not do this, we are driven to bring about an increased elimination by means of mineral waters, vapor baths, and massage. It is usually best to send the patients away periodically to watering places and sanatoria where their lives may be regulated.

The so-called arthritic constitution or gouty diathesis is characterized not only by these attacks of pain in the great toe and other joints but also by gastro-intestinal upsets, sometimes vomiting and sometimes diarrhea, and a great deal of melancholia or mental depression. There

may be also attacks of heart trouble, with palpitation and shortness of breath. There may be skin diseases, especially the eczemas. Then the recurrent headaches called migraine, neuralgias, cramps, and all that sort of thing belong to the people with this type of constitution.

CHAPTER XXXIV

CANCERS AND OTHER TUMORS

In insurance statistics covering the years 1911 to 1916 cancer had a death-rate of 70 per 100,000 of those exposed. It stood sixth in the list compiled in that study of deaths among policyholders. Among cancers those of the stomach and liver came first, with a rate of 26.3 per 100,000. Next came cancer of the female genitalia, with a rate of 14.7 per 100,000. Cancers of the peritoneum, intestines, and rectum had a rate of 8.3 per 100,000. The whites show a higher rate than the colored. The rate increased with the age, thus:

Age.	Rate.
1– 4	3.7
5– 9	1.4
10–14	1.3
15–19	2.8
20–24	4.1
25–34	15.7
35–44	76.2
45–54	198.6
55–64	382.5
65–74	617.2
75 and over	818.2

In 1923 there were reported to the Census Bureau 33,080 cases of cancer of the stomach and liver, a rate of 34.1 per 100,000.

In 1925 deaths from all types and locations of malignant tumors were given as 95,504, a rate of 92.6 per 100,000 people.

Whether the death-rate from cancer is increasing is still in controversy. But the number of reports of death from cancer is increasing, but this may be due to the refinement of diagnosis and to better death reports. But

the fact remains that there are too many deaths from cancer. Apparently the only way to reduce this number is to educate the public to submit tumors of any sort to competent physicians for examination and, if need be, excision. This must be done as soon as the tumor is discovered and not after it has made itself intolerable on account of its size, or weight, or weakening of the body.

A tumor literally means a swelling. More especially does it refer to those swellings which have a distinct form and entity, such as neoplasms, aneurysms, displaced organs, and syphilitic gummata. Hence, when a surgeon in examining a patient feels a distinct mass away deep in the abdomen where no resistance should be felt, he calls such a mass a tumor, without implying anything as to its meaning. The laity, however, seems to believe that a tumor is necessarily a malignant neoplasm; and in conversing with them the term "tumor" should not be used unless clearly understood.

A neoplasm (literally, a new growth) is a mass of tissue endowed with the power of independent growth, attached as a parasite to some tissue of the body. Some neoplasms are always enclosed in capsules through which they never break to infiltrate the neighboring tissues. They, therefore, weaken the organism simply by the amount of nourishment they draw from it. In contrast to the other kind, they are called benign. These others do not keep within a capsule, but do infiltrate and destroy the surrounding tissues, and weaken the body not only by stealing its nourishment but also by destroying its organs and poisoning it by their toxins. They are, therefore, called malignant.

Of the benign neoplasms, the fibroids (really myomata) of the uterus, the lipomata (or fatty tumors) of the skin, the angiomata (*e. g.*, the nevi or birthmarks) of the blood-vessels are common examples. Of the malignant neoplasms the carcinoma, derived from epithelial cells, and the sarcoma, derived from connective tissue, are the best

known. The two last are known by many people as cancers, but, strictly speaking, a cancer is a carcinoma.

There are at least two schools of thought with regard to the origin and transmissibility of malignant tumors. The one school thinks that the tumors originate from infestation or infection with some vital or living organism, and that they therefore can be transmitted. The other school believes that they are due to the misplacement of embryonic tissue, and to the irritation of such misplaced tissues. The weight of opinion is toward the second view, but laboratory studies are still proceeding on the matter of tar cancers (which are produced by irritating tissues with tar), and animal cancers such as those found in mice. But up to date no contagiousness or infectiousness of cancers has been proven.

Cutting into such tumors or bruising them seems only to stimulate them to increased growth. Hence the danger of any except radical operations on malignant growths.

The growths are made up of endlessly proliferating cells with few if any blood-vessels. Therefore, the tumors can never become very thick or far removed from the blood-vessels of the tissue acting as host. They therefore extend and spread, rather than grow thick and pendulous.

Carcinomata are found chiefly in the female breast, the uterus, the stomach, and on the skin of the face. Naturally, they vary much as to the rapidity of growth and their power of starting new growths by sending out cells through the blood and lymph channels. Those of the face, called epitheliomata, are the slowest growing and the least malignant. The sarcomata grow in the bones, in the orbit of the eye, in the cavities adjoining the nose, from the ligaments, etc. Some of these are black in color and are then called melanomata. An endothelioma starts from the inner coat of the blood-vessels and is generally classified with the carcinomata. Both kinds

of neoplasms are classified by the pathologists according to the type of cell presented, whether round or spindle shaped, or whether large or small. This is, however, a detail and need not interest us here. Another malignant growth is called the syncytioma malignum. This tumor grows on the site of the placenta, in the uterus after abortions, etc.

Treatment.—The only effectual treatment for malignant tumors is complete extirpation. This can occur only when the tumor is young and small, because the tumor very soon infects all the neighboring glands, and spreads by way of the blood and lymph channels to various parts of the body. Hence there is a great premium on early diagnosis. Because of the great issues at stake, patients with suspicious tumors should not hesitate to have pieces removed for examination under the microscope.

The *x*-ray cures small epitheliomata, but it cannot cure tumors beneath the surface of the body. In general, the best procedure is to remove the tumor thoroughly with the knife, and then expose the wound to the *x*-ray to prevent a return. No serum has as yet been found that is at all certain. Nuclein and trypsin have as yet only an empiric interest.

When a nurse is given charge of a patient with an inoperable cancer on the surface of the body her duty is to keep the tumor from smelling by keeping it washed with hydrogen peroxid, and by keeping the surface somewhat hard by using formalin freely on it.

Fibroids of the uterus usually demand removal. If the whole uterus has degenerated into a series of fibroids, the whole organ must be removed. These growths occur most frequently in patients from thirty to fifty years of age. Similar action should be taken with other benign tumors not only because of the cosmetic effect but also because they seem liable if left alone to degenerate into malignant tumors.

CHAPTER XXXV

DISEASES OF THE EAR

The rate of deaths from ear diseases was 1.8 per 100,000. The particular disease is usually otitis media, which has gone on to produce mastoiditis and finally a fatal meningitis. The infection usually enters from the postnasal space through the eustachian tube. Prophylaxis, therefore, demands that such infections of the nose and throat be promptly cared for.

Some 15 per cent. of the school children of the United States show defects in hearing. These may be thought of as practically all due to past cases of otitis media. Here again it is probably the neglect of colds and "runny" noses that lead to the deplorable results.

To understand even vaguely the diseases of the ear one must keep in mind its anatomy. In the first place, it should be clearly understood that there are three very different parts to the ear so separate that a disease might easily be confined to each. Thus the external ear, which includes the drumhead (membrana tympani), is very liable to external violence and injury, but it might be entirely removed and still the patient's hearing would hardly be impaired. It is only an accessory organ, and mechanical in its action. The middle ear consists of a bony cavity connected on the one side with the air cells in the mastoid process of the temporal bone, and on the other with the nose by a tube (eustachian tube) about $1\frac{1}{2}$ inches long. It contains the ossicles, which serve to transmit in a strengthened form the vibrations from the drumhead to the inner ear. Since the middle ear has such an open connection with the posterior nares, it is very liable to infection from colds, catarrh, diphtheria, and other infectious diseases of the nose and throat. Then,

too, the thinness of the bony wall between the brain and the mastoid cells makes it very easy for abscesses of the middle ear to develop into brain abscesses—with fatal consequences. Finally, the inner ear consists of two different capsules filled with fluid and incased in solid bone set deep within the skull. Floating in this fluid are the ends of the auditory nerve. Hence, very little damage from the outer world can reach the inner ear except by

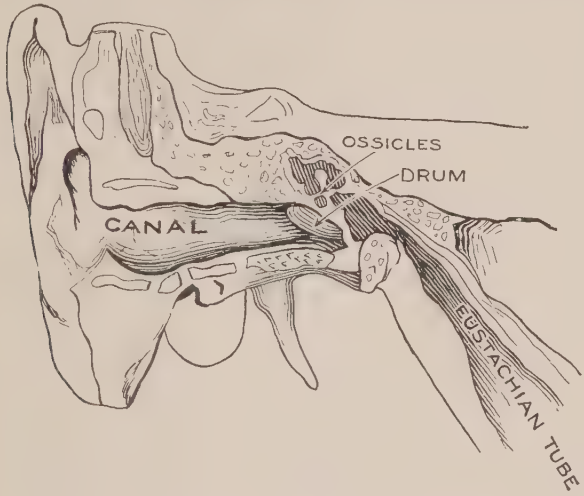

Fig. 53.—Diagram of the ear.

fracturing the skull. Infections do sometimes reach it, but it is only by way of the blood-current after the whole body has been exposed to the infection.

The troubles of the *external ears*, aside from those due to violence, are those due to faults in the secretion of the glands of the canal. Thus, the canal becomes obstructed with wax (cerumen) or little cysts form from the obstruction of glands along the sides. These disorders are best relieved by irrigating the canal freely with warm water or

solutions of hydrogen peroxid, which dissolve the cerumen nicely. When there is pain the irrigating fluid should be as warm as can be borne with comfort. The use of oils or of opium for the purpose of relieving the ear pain is a questionable procedure; warm water is much more effective and cleanly.

A large proportion of the pains referred to the ear are not due to ear troubles at all, but to interference with the many nerves which pass through the middle ear and about the temporal bone. Thus, inflammation in the lower jaw may be felt as pain in the ear; swellings of the parotid gland may have a similar result. So, also, an inflammation of the antrum of Highmore (the cavity in the cheek bone) may cause such diffuse pain that it would be referred to the ear. Therefore, for many ear troubles a dentist or a rhinologist may be the best doctor.

As might be inferred from the anatomy, the *middle ear* is most liable to disease. Such disease is usually the extension of some purulent disorder from the nose. The inflammation of the middle ear (*otitis media*) causes intense pain, with or without fever, and causes the ear drum to bulge outward until the pus eats a hole through it; and then the ear "runs." The inflammation, of course, attacks the ossicles also and renders them rough and rigid. Hence, after such an inflammation the patient is more or less hard of hearing. Finally, if the infection be especially virulent, the pus eats its way into the mastoid cells and forms there a mastoid abscess—with the threat of continuation into the meningeal cavity. A large number of middle-ear disorders result from chronic nasal troubles where the germs are not very virulent, and where we have only a subacute inflammation with but little pus, but a slow destruction of the ossicles and the lining membranes of the cavity. The condition rarely improves of itself, hence, whether the amount of pus is great or small, or whether there seems danger of mastoid abscess or not, middle-ear inflammation or "catarrh" should be given

treatment. If treated early there is a chance of saving most of the hearing. This treatment consists in opening the membrana tympani and irrigating the cavity with antiseptic or sterile fluids both from the ear and from the nose. This requires some skill, and a nurse should not try to irrigate a middle ear until she has practised it a few times under the eye of a specialist. Such cleansing must be kept up for months, and must be accompanied by the treatment of the catarrh and any other disorders of the body in order to do permanent good.

Otosclerosis, or the gradual thickening of the ear drum and the hardening of the ossicles and surrounding bone, is probably the most frequent cause of deafness. This is apparently not directly due to an active inflammation or catarrh. In fact, there is considerable reason for believing that the liability to it is inherited. At any rate, it begins usually in the thirties with a roaring or ringing in the ears (tinnitus aurium) and proceeds steadily until the sufferer is practically deaf. No efficient treatment has been devised. Our best efforts are along the line of constitutional help.

When a middle-ear disease has produced deafness it is better to remove all the ossicles and diseased tissue in the middle ear, because it has been found that the vibrations of the air itself are better heard than when dulled by being transmitted by stiffened bones.

In middle-ear and mastoid abscesses the nurse should keep an ice-bag applied to the affected side until the surgeon can operate. Such patients need to be kept very quiet. The bowels should be kept open. The diet must, of course, be largely liquid, but it should be as nourishing as can be given. Considerable water should be drunk, and the skin needs frequent cleansing with stimulating rubs, *e. g.*, with alcohol. When, however, the ear pain is a reflex or referred one the hot-water bottle is very comforting and usually sufficient.

Inner ear troubles are usually derived from brain tumors,

or from the degeneration of or pressure upon the nerve. A peculiar dizziness or vertigo coupled with the hearing of a sound similar to the singing of a tea-kettle, is one of the inner ear diseases. It is known as *Ménière's disease*, from the name of the man who first described it. The patient is apt to fall when attempting to walk alone. Heavy doses of quinin sometimes relieve the trouble for a time.

Seasickness is a disorder of the inner ear because it is usually due to the disturbance of the fluids in the semicircular canals, and, since it consists essentially in presenting to the brain a new sensation, is overcome by accustoming the brain to that new sensation. Inner ear disorders, then, are beyond the use of any except constitutional treatment. Fortunately, they are rare.

CHAPTER XXXVI

THE COMMONER EYE LESIONS

(Revised by Joseph W. McKee, M.D.)

Anatomy.—In order to understand better the common diseases of the eye it is well to review briefly the anatomy of this complicated structure. Thus we may say that the eye is constructed on the principle of photographic camera. The eyeball is about one inch in diameter, and is made up of three main coats, within which are transparent fluids.

1. Outer coat { Sclera—*i. e.*, the white, fibrous portion. / Cornea—*i. e.*, the clear portion.
2. Middle coat { Iris—*i. e.*, the blue portion. / Choroid—*i. e.*, the vascular portion. / Ciliary body—the muscle which controls the pupil.
3. Inner coat—retina, *i. e.*, the nerve portion.
4. Contents { Aqueous humor in front of the lens. / Vitreous humor behind the lens. / Lens—a crystalline body attached to the ciliary body.

The sclera or white portion of the eye is the box, and the cornea or clear portion of the eye acts as the window. Just back of this window is the iris or blue pigment portion. The iris acts as a shutter which controls the size of the pupil. Just behind the pupil is a round, transparent body called the lens. The rays of light as they enter the eye pass through the lens, and are focused on the retina or innermost coat. The retina is the nerve layer, and is really a fan-shaped termination of the optic nerve, which enters

the globe at the back. Between the sclera and the retina we have the choroid. This coat is very vascular, and furnishes the nutrition for the other structures.

Covering the anterior portion of the eyeball, with the exception of the cornea, is a coat of mucous membrane called the conjunctiva. This is reflected back and also covers the under sides of the eyelids.

As far as we need to concern ourselves here, eye lesions may be grouped into those of the conjunctiva, those of the iris, those of the cornea, those of the lens, and those of the nerve and retina.

The most important *conjunctival lesion* that demands the attention of a nurse is **gonorrheal ophthalmia.** This is so generally a disease of the newborn that it has also the name of ophthalmia neonatorum. It is due, as its name indicates, to the diplococcus of gonorrhea. The newborn babe acquires it while the head is passing through the vagina at birth. Older patients acquire it from wiping their faces with infected towels or from the fingers. In order to protect the infant the nurse should instil 1 or 2 drops of a 1 per cent. solution of nitrate of silver, or a stronger solution of an albuminate of silver, into the baby's eyes (into the conjunctival sac, not on the cornea) while she is washing him for the first time. In fact, in many states the midwives and obstetricians are required to do this as a routine measure, and it has resulted in saving the eyesight of hundreds of children. The disease causes a copious discharge of pus from the eyes. The conjunctiva is red and swollen; there is photophobia (*i. e.*, light striking the eye causes pain); the lids are so swollen that they can be opened only with difficulty. The pus backs up behind the closed lids and this pressure causes ulceration of the cornea, and subsequent perforations. The perforation of the cornea allows the escape of the aqueous humor and the iris falls forward into the opening and an opaque mass results. The patient is then hopelessly blind. Naturally, the disease is very infectious;

so that unless the most vigorous steps are taken to prevent it, the second eye is infected from the first. Hence, if a patient is found with only one eye infected, the other eye should be immediately cleansed with antiseptic solutions, and sealed under a watch crystal in such a way as to prevent the access to it of germs. The sealing material is usually adhesive plaster around the rim of the glass. The chief factor in treating gonorrheal ophthalmia is cleanliness. The lids should always be kept clean with a warm solution of boric acid, in order to prevent the pus from backing up and pressing upon the eyeball. The pus should be washed out carefully, but no forcible irrigation should be used. The best solution for instillation into the eye is $\frac{1}{4}$ per cent. solution of nitrate of silver. A 25 per cent. solution of argyrol, or a 10 per cent. solution of protargol will do very well. The ability to keep the lids clean and the pus out of the eye is often the deciding factor in the success of the treatment. The nurse should wear rubber gloves when treating the patient, and should not mingle with the household until she has changed her gown and has had an antiseptic bath. It is, therefore, well for the nurse to have at her elbow a bowl of mercuric chlorid in 1 : 1000 solution, in which to dip her hands and the non-metallic instruments. One to two weeks of excellent care will be needed, in most cases, before the inflammation subsides and convalescence sets in.

Other more common, acute forms of conjunctivitis may be brought on by various types of bacteria, or by irritation from dust or chemicals. Pink-eye is caused by infection with the Koch-Weeks bacillus. This particular type of conjunctivitis is quite infectious, and is common amongst school children. It responds to treatment with solutions of albuminate of silver and to solutions of zinc sulphate, about one grain to the ounce. Pink-eye and a conjunctivitis due to infection with the pneumococcus are frequently confused with gonorrheal ophthalmia, and a microscopic examination should be made to differentiate

them. The eyes should always be kept clean with a 4 to 5 per cent. solution of boric acid. The solution should be dropped freely into one canthus of the eye and the eyeball rotated until every part of the conjunctival sac is cleansed. Such an inflammation may last a few days, depending a great deal upon the treatment the eye receives. The condition should not go untreated because it is likely to leave the inner surfaces of the lids in a roughened condition.

Those nurses who take up school nursing will be called upon to differentiate between two forms of chronic conjunctivitis that in their early stages closely resemble each other. These are trachoma and follicular conjunctivitis. Trachoma is a very serious, infectious form of conjunctivitis that is difficult to cure and, if permitted to go untreated, frequently leads to blindness. It is an inflammation of the conjunctiva which attacks more especially the fornices, and is characterized by the formation of granules underneath the mucous membrane. These granules are more marked on the under surface of the upper lid. Follicular conjunctivitis is a harmless condition, characterized by granules limited more to the lower lid. Trachoma is a disease of filth, and is found chiefly amongst the poorer classes where hygienic conditions are poor. The treatment of this condition requires patience. It consists of painting the inner surfaces of the lids with 2 per cent. solution of nitrate of silver, and of the occasional use of copper sulphate. Not infrequently some operative procedure must be resorted to.

When the glands along the margins of the lids become inflamed we have a redness and swelling that is called **blepharitis.** If the duct of a gland is obstructed, we have **sty** (hordeolum). This heals usually as soon as the cyst is incised and its contents expressed. If the deeper glands (meibomian) are obstructed, the swelling is called a **chalazion,** and needs the same sort of treatment.

A **corneal ulcer** is due usually to the spreading of a

conjunctivitis to the cornea. It betrays its presence by a grayish discoloration. The pain is intense. If it perforates, blindness is apt to result. Perforation is almost unavoidable if treatment is not instituted promptly. This consists in using a few drops of atropin in 1 per cent. solution to dilate the pupil and remove the irritation. Next, the physician touches the ulcer with caustic, to stop the spreading of the ulcer and kill the germs at work. Then a bandage is put on and the patient kept quiet. The bandage should be removed twice daily in order to irrigate the eye with an antiseptic solution.

First-aid treatment in injuries of the eye is very important. This is frequently the deciding factor in the saving of an eye. Alkali burns, such as lime burns, call for thorough irrigation with a mild acid solution such as boric acid,—the thorough cleansing being of the utmost importance. It is frequently necessary to instil a 4 per cent. solution of cocain before the lids can be held apart. In all burns, whether acid or alkali, a mild oil, such as olive oil, should be instilled into the eye after the eye has been cleansed. This tends to prevent the raw surfaces from adhering together.

In injuries that have perforated the globe, there is danger in too much manipulation. A solution of 1 per cent. atropin sulphate should be instilled, and the eye bandaged until a physician can be called.

Inflammation of the iris is due generally to constitutional disorders such as syphilis or rheumatism. The local treatment consists in using atropin to dilate the pupil and hot fomentations to produce a local hyperemia. The eye must be protected from the light. Iritis is stubborn, and the result of the treatment depends largely on the primary cause.

The chief disorder of the *lens* is the formation of cataract. This means simply that the lens has become opaque. It must then be removed. This is done through an incision on the side of the eyeball. The operation,

though requiring great skill, is short and almost painless. Asepsis is the one condition of success. Cataracts usually come on in old age, but injuries and diseases of the eye may bring them on earlier; and some are congenital.

The **optic nerve** sometimes becomes inflamed or degenerates. Tumors of the brain, meningitis, hydrocephalus, obstruction to the artery, syphilis, nephritis, and arteriosclerosis are the common causes. The result is, of course, blindness. Sometimes something, after the cause has been removed, may be accomplished by using hot fomentations or ice-bags, as the case may require to re-establish the circulation in and through the nerve-fibers.

The most frequent eye trouble is **eye-strain,** due to a defect in the lens system as an optical instrument. Very few eyes are wholly perfect. Therefore, when a person must do much close work, such as studying or sewing, a correcting glass may be required—something that would not be needed if one were to do only coarse, outdoor work. The symptoms of eye-strain are frontal and occipital headaches, vertigo, gastric disorders (including vomiting), and general nervousness—even epileptiform seizures. The power of accommodation is greater in children than in adults. Hence many people do not discover that their eyes are defective until they reach the age of twenty-five or thirty. To examine the eyes of a person under forty the oculist must temporarily put the power of accommodation out of commission; for this purpose he uses atropin. With the eye at rest he can study its defects and needs. For these reasons it is not well to buy glasses of peddlers, or have them fitted by anyone who is not a graduate physician.

Color-blindness is very common, but has for the ordinary individual no significance beyond its inconvenience. There is no cure for it.

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Hallie Washburn

Leaksville

N.C.